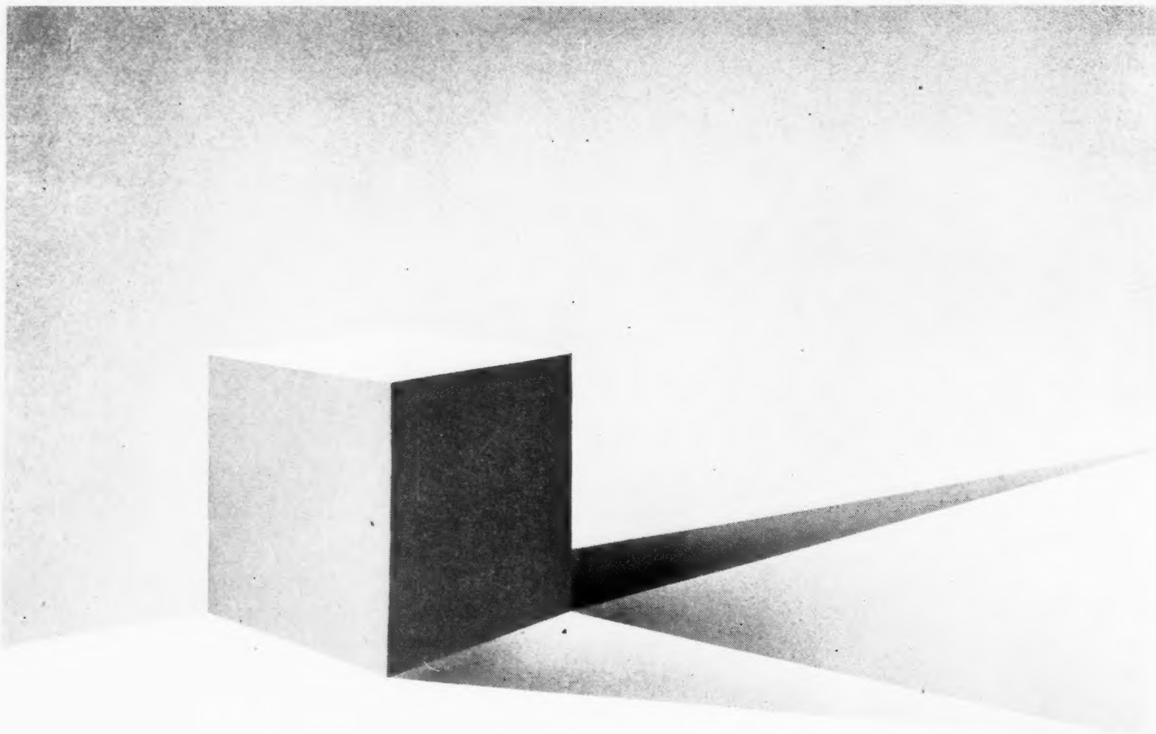
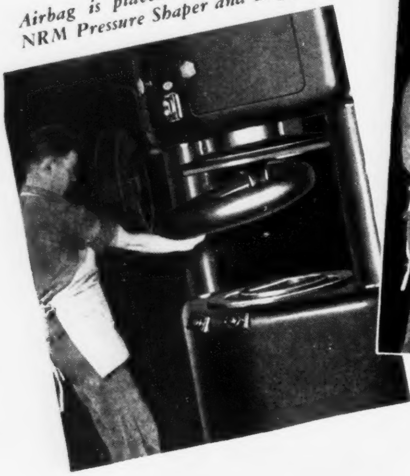
INDIA RUBBER WORLD

NTHETIC

APRIL, 1947

INDIA RUBBER WORLD, April, 1947, Vol. 116, No. 1. Published Monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per Year; All Other Countries, $4.00; Single Copies 35 Cents. Address Mail to New York Office.

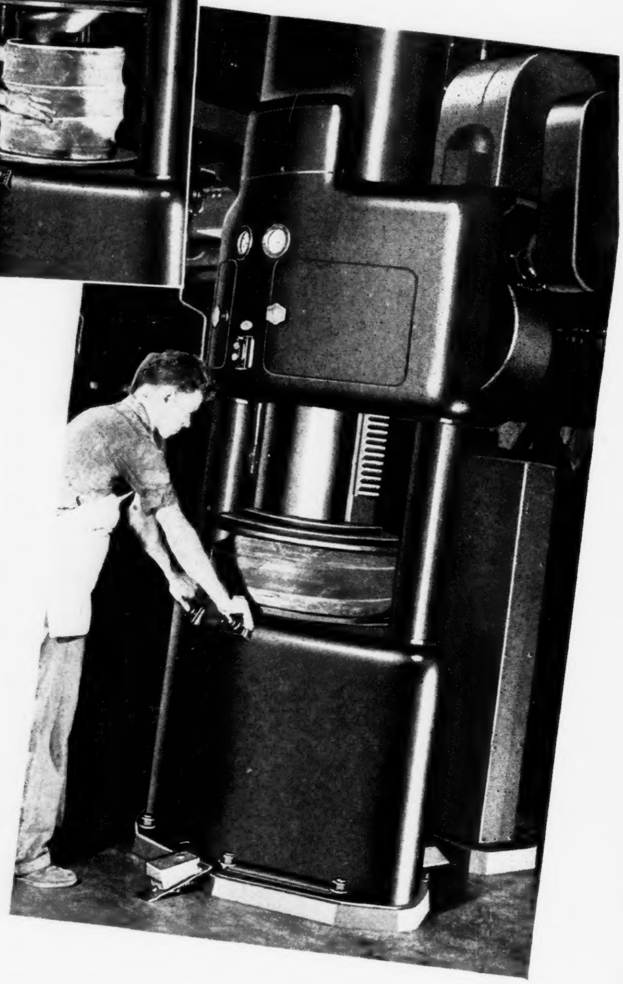




Airbag is placed on ram-hook of NRM Pressure Shaper and Bagger.

With airbag drawn up in ram, tire is placed in position.

Downstroke shapes tire and bags it simultaneously.



Ap

a

Technical Bulletin No. 31

on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

GR-S—X-349 with 100 Parts of Zinc Oxide

X-349 is defined by *Office of Rubber Reserve* as follows: "*A copolymer made with a limited amount of Dixie modifier fed increment wise. Because of its high Mooney, heat softening is required to obtain satisfactory processing; polymerization temperature and conversion lower than usual. Coagulated with salt and acetic acid. Similar to German Buna S-3. It is hoped that superior tread wear in tires made from this polymer will be exhibited.*"

COMPOUND NO. 31	
GR-S—X-349	100.0
Sulfur	3.25
MBT	1.25
DPG	0.15
Coumarone-indene Resin	7.5
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of:				Permanent Set	Shore Hardness	Tear Resistance Tested at:	
			200%	300%	400%	500%			Room Temp.	100°C.
2	1200	925	145	220	330	435	.52	45	196	77
4	2480	710	340	610	915	1300	.19	51	85	42
7.5	2170	565	420	725	1180	1715	.15	55	85	46
15	1500	390	575	1000	....	....	.10	57	79	44
30	1750	380	700	1125	....	....	.11	58	70	37
45	1960	420	615	1040	1690	....	.14	59	70	38
60	1670	405	580	1050	1630	....	.12	59	70	35
90	1980	430	620	1010	1710	....	.11	60	64	37

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum				Compression Fatigue (Goodrich Flexometer)*					Cut-Growth Resistance Tested at 70° C. Inches Failure
	Indentation in mm.	Per Cent Rebound	Hardness		Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise ° C.	Dynamic Compression		
			Shore	Rex				Initial	Final	300 Cyc.
60	7.13	68.6	59	61	20.7	15′ 3.0	26.5	9.5	12.1	.48

* Test Conditions: 143 Lb. Load. 0.175″ Stroke. 100° C. Oven Temp.

THE results with X-349 give further confirmation of the observation that better reinforcing properties with Zinc Oxide are obtained with the high Mooney polymers. (See Technical Bulletin No. 28 reporting results with X-272, now known as GR-S-16.)

The X-349 was not heat-softened prior to compounding; the polymer was given a 10 minute cold break-down, but failed to band on the mill. Hot milling followed (starting temperature 93° C.) during which time the coumarone-indene resin and sulfur were added; the stock was cooled and the Zinc Oxide and remaining compounding materials added. The Zinc Oxide apparently exerts a plasticizing action, since the stock banded satisfactorily.

The results are outstanding in comparison with Standard GR-S with respect to tensile, modulus, tear resistance and rebound. Previous experience with Buna S-3 would indicate that the advantages for X-349 would persist after heat-softening. Tests with heat-softened X-349 are now in progress and will be reported later.

recipes:

How to Make a Fine Finished Rubber Product!

Take any one of Buffalo's Standard Reclaims, blend with GRS or with Crude Rubber and compounding agents; you'll market a product that gives EXTRA economy and performance . . . has SUPERIOR sales appeal!

NATURAL WHOLE TIRE
Black Diamond L . . . 127 . . . 5003 . . . 2013

SYNTHETIC WHOLE TIRE
U. S. 140 . . . U. S. 1013

NATURAL PEEL
Special 33 . . . 5203

SYNTHETIC PEEL
U. S. 5212

NATURAL CARCASS
Tioga . . . 4506 . . . 4536

NATURAL TUBE
Bison . . . Red Oak

U. S. RUBBER RECLAIMING CO., INC.

500 FIFTH AVENUE • NEW YORK 18, N. Y. • (Plant at Buffalo, N. Y.)

TRENTON . . . H. M. ROYAL, Inc., 689 Pennington Avenue • TORONTO . . . H. VAN DER LINDE, Ltd., 156 Yonge Street

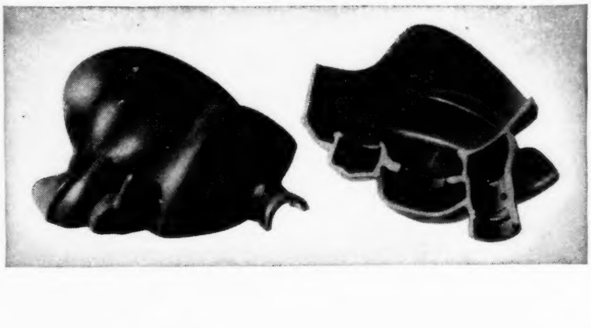
64 Years Serving the Industry Solely as Reclaimers


TIRE PRESSURE GAUGE
VALVE REPAIR TOOL
VALVE CAP
VULCANIZER
SPARK PLUG TIRE PUMP
One
BIG FAMILY—
and They're All Schrader
PASSENGER TIRE VALVE
VALVE CORE
Schrader has devoted more than a century exclusively to the scientific study and manufacturing of a line of products to control compressed air.
How well Schrader has succeeded in reaching its objective is evidenced in the completeness of its line and its world-wide acceptance.
Schrader valves are adaptable to various types of tubes, rims, wheels—on every type of pneumatic tired vehicle, from half ton jeeps to twenty ton giants.
As a result of this pioneering and leadership, Schrader has rightfully earned the title, STANDARD THE WORLD OVER
LEVER TYPE BLOW GUN
PENCIL TYPE GAUGE
TRUCK TIRE VALVE
SCHRADER PRODUCTS Make Tires Last Longer!
AIR CHUCK
Schrader
REG. U.S. PAT. OFF.
PRODUCTS CONTROL THE AIR
HAND BENDABLE VALVE
A CATALOG OF A COMPLETE TIRE SERVICE
If you have not received your copy of Schrader Catalog No. 48-A, write today to Box No. 240, General Post Office, Brooklyn 1, N. Y.
VALVE CAP
A. SCHRADER'S SON, Division of Scovill Manufacturing Company, Incorporated, BROOKLYN 17, NEW YORK

They said it couldn't be done...

So we did it!

Photo courtesy The Ohio Chemical Co.



WHEN specifications for this high altitude oxygen mask were set up, many "experts" in the use of latices and mixes said flatly that the job couldn't be done with latex. The intricate system of ducts, the metal insert in the nose piece, the rigid tolerances, they claimed, were just too much to expect from a water system.

So . . . American Anode researchers and engineers went ahead and did it—produced the forms, engineered the production, and helped turn out finished masks by the millions.

It's typical of the many "impossible" jobs that we have taken on for our customers and prospects. And we believe that it proves that the possible uses for latices and mixes are practically limitless.

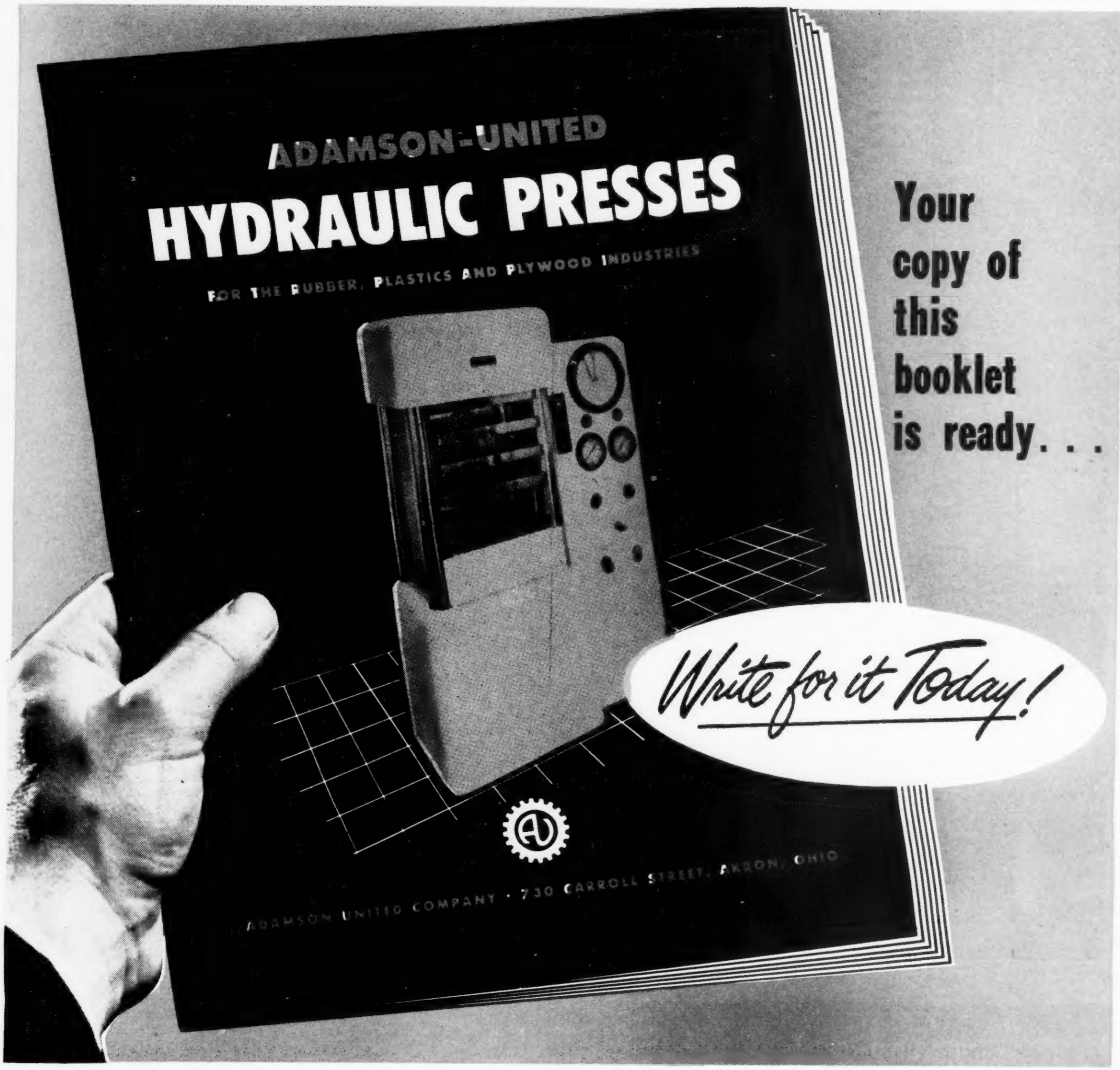
Do you have an idea for a new product that you don't know how to produce? We're not miracle workers, but we believe that we'll come closer to working miracles with latices than anyone else in the country. That's why we offer you the services of our research and technical staff to help you with any product or problem which you may now have.

Latices and compounded mixes of GEON, HYCAR, Saran, neoprene, crude rubber, and GR-S are available. For more information about these modern materials and *methods for using them,* please write Dept. AH-2, American Anode Inc., 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

INCORPORATED

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS



It illustrates and describes the various types of presses successfully used by the country's largest manufacturers of rubber and plastics products.

Designs of the various units illustrated are available for reproduction or they may be revised to meet specific operational or product requirements. A letter requesting a copy places you under no obligation.

We also invite your inquiry concerning presses for new or unusual applications. Our engineers will gladly cooperate with your own technical staff in the development and design of all types of equipment and processes for rubber and plastics manufacture.

ADAMSON UNITED PRODUCTS

- Mills
- Refiners
- Crackers
- Washers
- Rubber Sheeting and Coating Calenders
- Plastic Film Calenders
- Calender Wind-ups
- Calender Cooling Rolls
- Complete Calender Accessory Equipment
- Large Molds
- Pot Heaters
- Vulcanizers
- Autoclaves
- Hydraulic Presses
- Multi-Platen Presses
- Automatic Curing Presses
- Belt Curing Presses
- Compression Molding Presses
- Plywood Presses
- Auxiliary Equipment

ADAMSON UNITED COMPANY

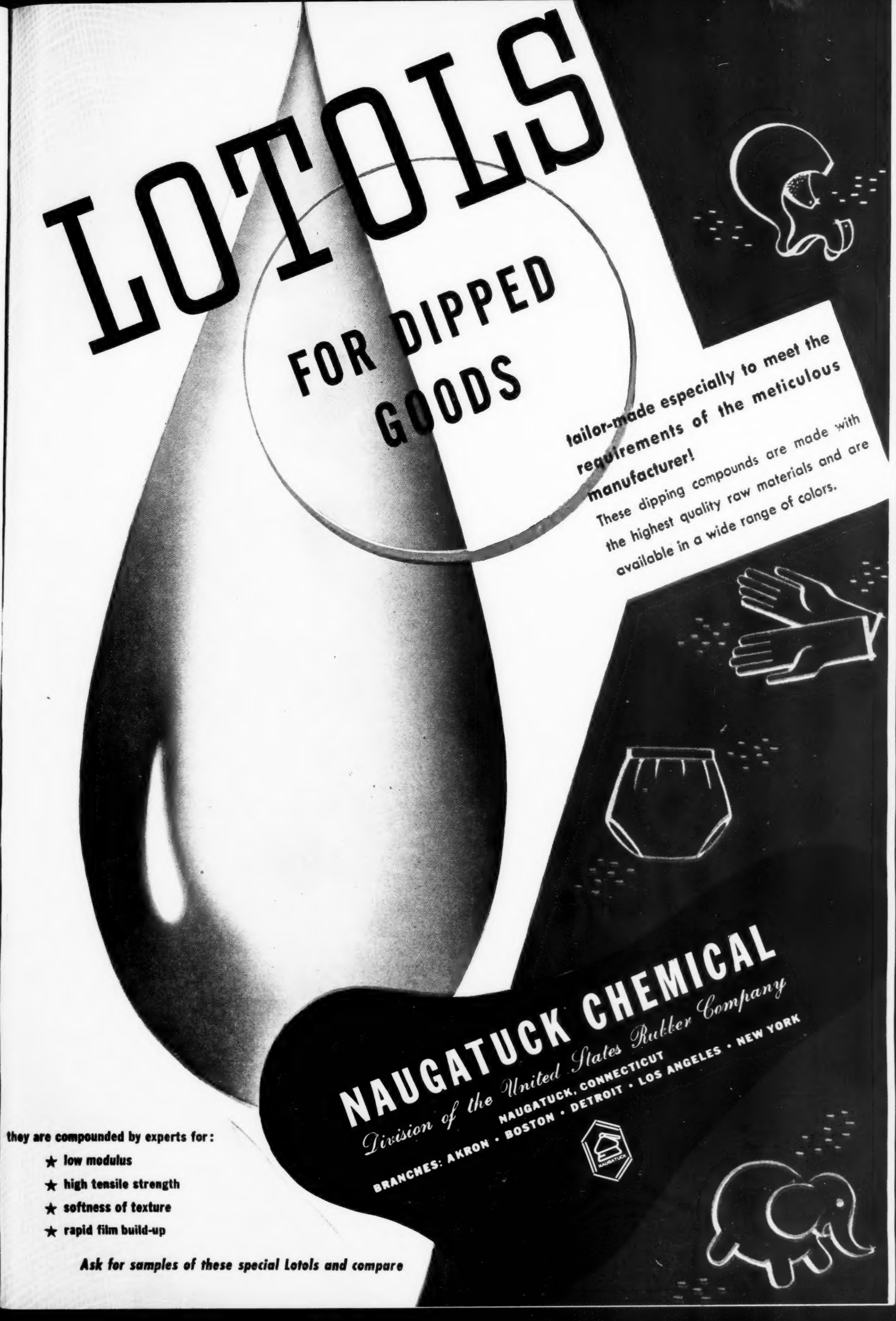
Largest Supplier of Hydraulic Presses For The Rubber and Plywood Industries

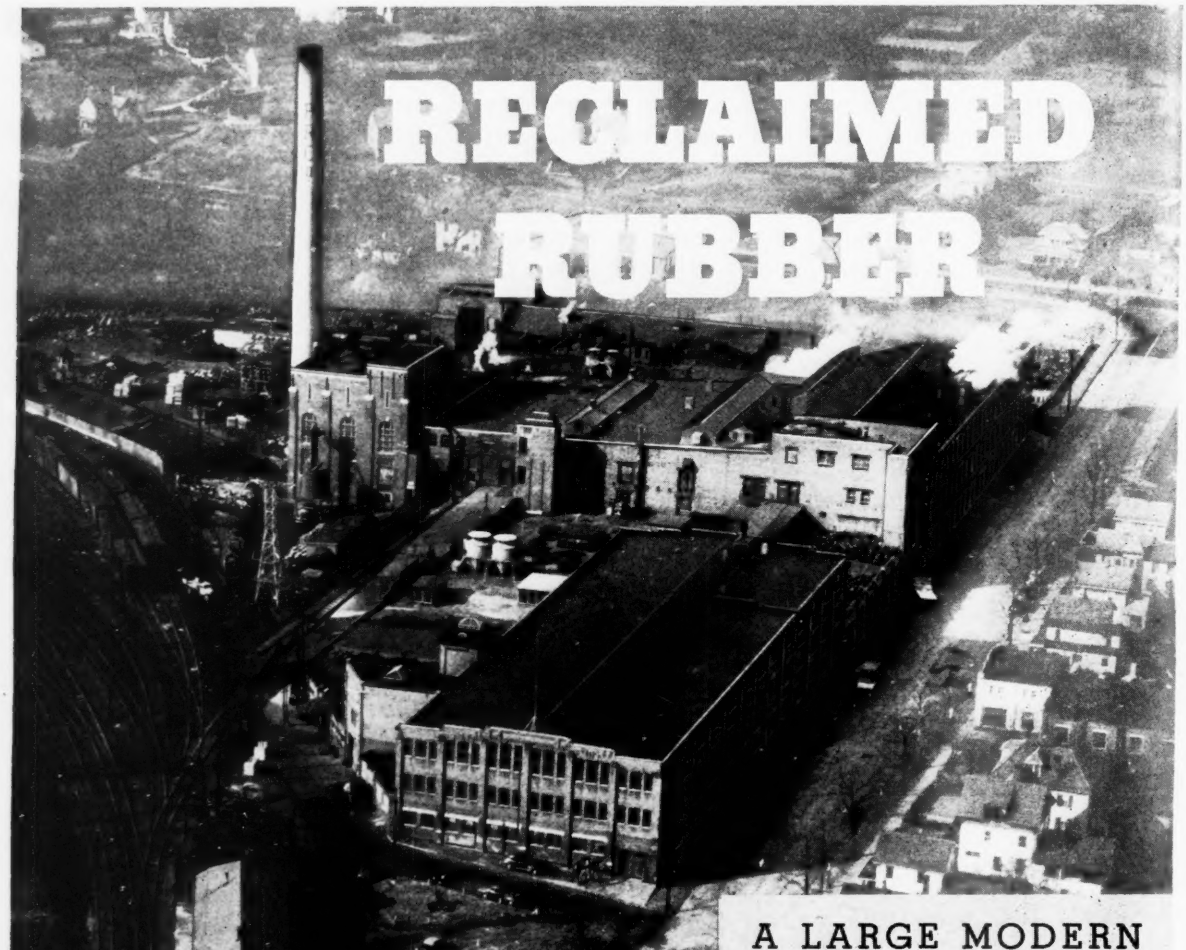
AKRON, OHIO

In the New York Area address inquiries to
441 Lexington Ave., New York City

In the Chicago Area address inquiries to
140 S. Clark St., Chicago, Illinois

Subsidiary of United Engineering and Foundry Company


LOTOLS
FOR DIPPED GOODS
tailor-made especially to meet the requirements of the meticulous manufacturer!
These dipping compounds are made with the highest quality raw materials and are available in a wide range of colors.
NAUGATUCK CHEMICAL
Division of the United States Rubber Company
NAUGATUCK, CONNECTICUT
BRANCHES: AKRON · BOSTON · DETROIT · LOS ANGELES · NEW YORK
they are compounded by experts for:
★ low modulus
★ high tensile strength
★ softness of texture
★ rapid film build-up
Ask for samples of these special Lotols and compare



PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

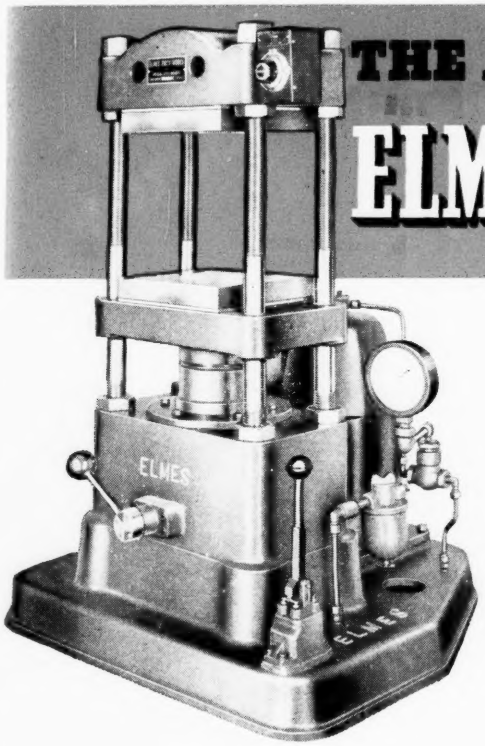
MAIN OFFICE and FACTORY **BUTLER, NEW JERSEY**

New England Representative
HAROLD P. FULLER
203 Park Square Bldg.
Back Bay, Boston, Mass.

European Representatives
BURNETT & CO. (London) Ltd.
46 Herga Court
Harrow-On-Hill, Middlesex, England

THE AMAZING NEW ELMES HYDROLAIRS

Patents Applied for



30-ton Bench-Type
(Also made in 20-ton)

FAST, POWER-OPERATED PRESSES THAT ARE Pumpless, Motorless!

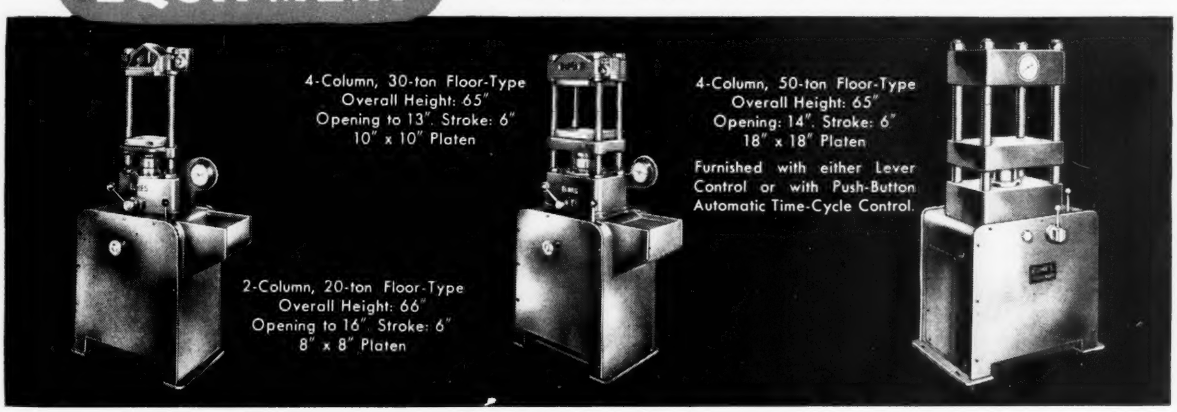
Big savings for small-press users! Low purchase price. Simple installation. Speedy performance. Power costs only about *one-fiftieth* of a penny per average cycle, because Hydrolairs have no pumps or motors. They operate entirely from the shop air line. Just connect them up, and they're ready to go.

They Turn Out a Lot of Work. Effortless lever control governs both quick closing and *instantaneous* full pressure. Hydrolairs apply and maintain the selected pressure, and *repeat* at that pressure until reset. They're ideal for molding plastics and rubber, for laminating, for repetitive compression tests, and for every other pressure purpose.

You Can Increase Your Profits. Write today for new Bulletin 1036. It tells the whole story about this *amazing* hydraulic principle; gives uses and complete specifications on the full line of bench- and floor-type models. For pressures up to 50 tons, new Elmes Hydrolairs are the presses to buy.

ELMES
Since 1851
HYDRAULIC EQUIPMENT

20-, 30-, AND 50-TON FLOOR-TYPE HYDROLAIRS



ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 232 N. Morgan St., Chicago 11, Ill.

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

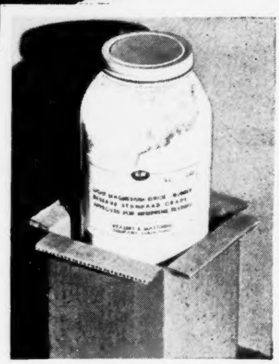

LATEX AND RESIN COMPOUNDS
We specialize in "ready-to-use" compounds, *custombuilt* to your requirements. Featuring natural and synthetic latex, and resins, we offer a complete service — from research to finished product. For any bonding, coating, dipping, or impregnating problem, it will pay you to call on our laboratory advisory service.
GENERAL LATEX & CHEMICAL CORP.
666 Main Street, Cambridge, Mass.
GENERAL LATEX & CHEMICALS (CANADA) LTD.
Verdun Industrial Buildings, Verdun, Montreal, Quebec
Sales Representatives:
525 Washington Highway, Snyder, N.Y.
304 West 42nd Street, New York City
First Central Tower Bldg., Akron, Ohio
2724 West Lawrence Ave., Chicago, Ill.

WE MAKE ONE GRADE OF LIGHT MAGNESIUM OXIDE AND IT IS TOPS!

K&M best in asbestos

THIS is the policy of Keasbey & Mattison . . . one and *only one* grade of light magnesium oxide. It reduces your problem to a minimum.

- Always uniform in quality
- Always light in weight
- Manufactured under precise control from beginning to end
- Made to meet compounders' needs
- Available in large quantities



R. R. C.'s approved standard.

KEASBEY & MATTISON
COMPANY, AMBLER, PENNSYLVANIA

One of America's oldest and most reliable makers of asbestos and magnesia products. Founded 1873

OUR DISTRIBUTOR FOR K&M LIGHT MAGNESIUM OXIDE IS:

AMERICAN CYANAMID COMPANY

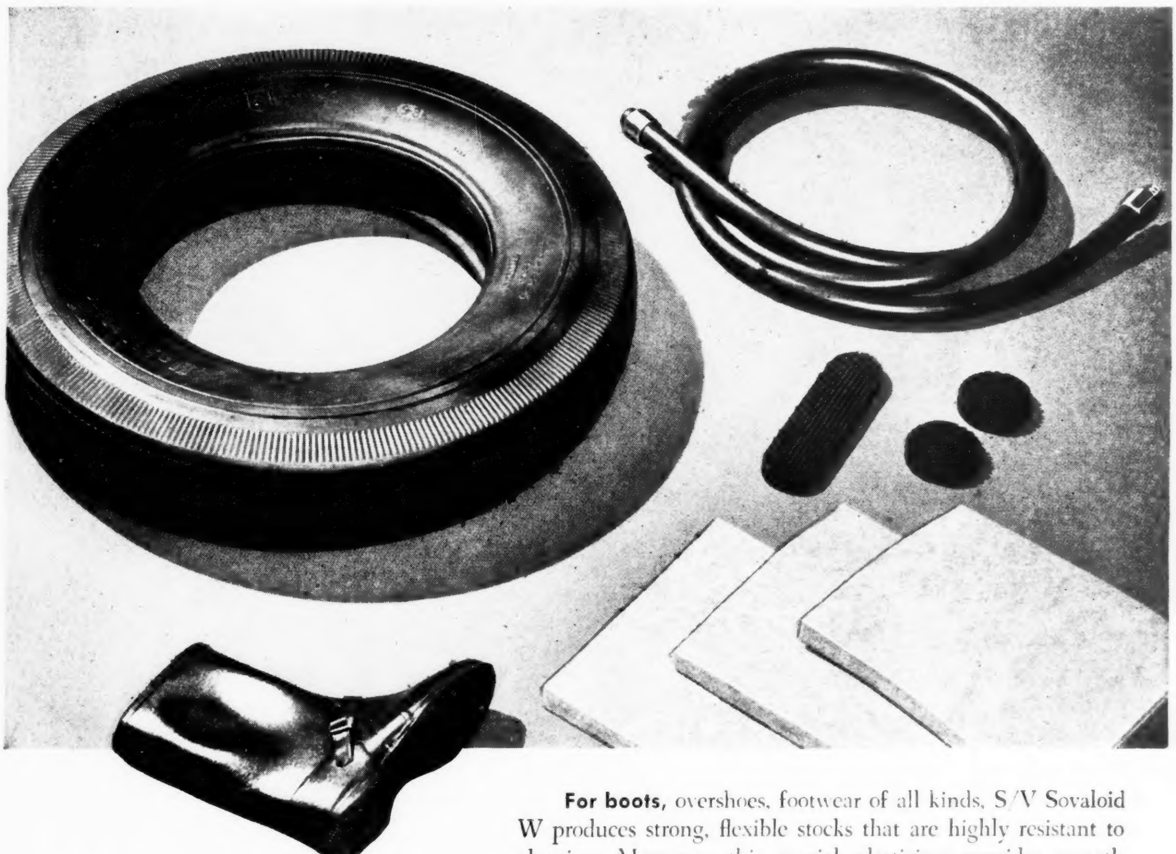
30 Rockefeller Plaza, New York 20, N. Y.

WITH SALES REPRESENTATIVES TO THE RUBBER INDUSTRY AND STOCK POINTS:

AKRON, OHIO, Akron Chemical Company
BOSTON, MASS., Ernest Jacoby & Company
CHICAGO, ILLINOIS, Herron & Meyer
LOS ANGELES, CAL., H. M. Royal, Inc.
TRENTON, N. J., H. M. Royal, Inc.

D

y
any



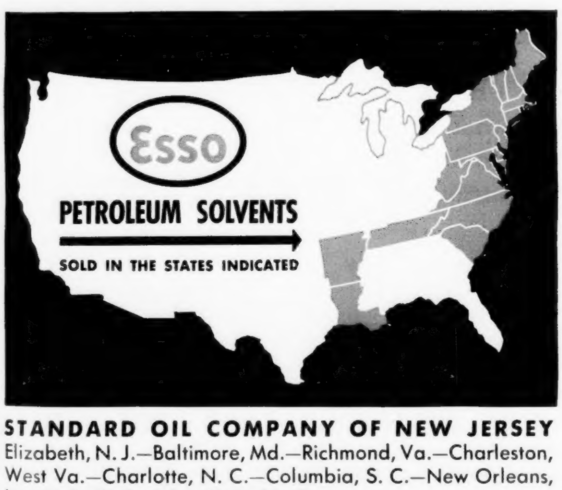
IT'S TRUE...

THE ENTIRE DAILY WATER CONSUMPTION OF NEW YORK CITY DOES NOT EQUAL THE AMOUNT THAT ROLLS OVER NIAGARA FALLS IN JUST 7½ ***MINUTES!***

IT'S TRUE OF ESSO SOLVENTS

THE LARGEST PETROLEUM RESEARCH LABORATORIES IN AMERICA PROVIDE EXPERT TECHNICAL SKILL IN THE PRODUCTION OF ***ESSO SOLVENTS*** *. . . . . ONE REASON WHY CONSTANT UNIFORMITY AND SUITABILITY IN ALL 11 GRADES IS ASSURED.*

Hundreds of industries meet all solvents requirements by calling in an Esso representative. His honest, friendly advice might benefit you. Contact him next time a problem comes up.



STANDARD OIL COMPANY OF NEW JERSEY
Elizabeth, N. J.—Baltimore, Md.—Richmond, Va.—Charleston, West Va.—Charlotte, N. C.—Columbia, S. C.—New Orleans, La.—Little Rock, Ark.—Memphis, Tenn.

STANDARD OIL COMPANY OF PENNSYLVANIA
Philadelphia, Pa.

COLONIAL BEACON OIL COMPANY
Boston, Mass.—New York, N. Y.

FARREL-BIRMINGHAM MADE "SPECIALISTS" OF THIS MILL AND CALENDER

how

Here is a typical example of how Farrel-Birmingham engineers applied special equipment to rubber working machines and designed a unit for processing another plastic material—in this case, phonograph record blanks.

The assembly illustrated consists of a 22" x 60" mill and a 14" x 44" two-roll calender with blanking attachment.

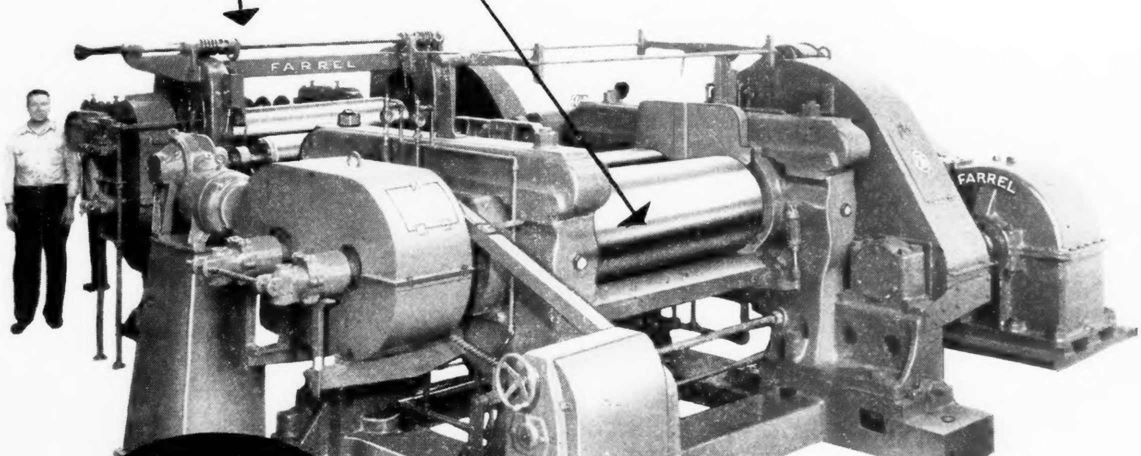
The rolls of both mill and calender are chilled iron, chamber-bored and fitted with rotary joints for the circulation of temperature regulating medium. The bronze-lined journal boxes are automatically lubricated. Drive and connecting gears have cut teeth and are bath lubricated in sheet steel guards.

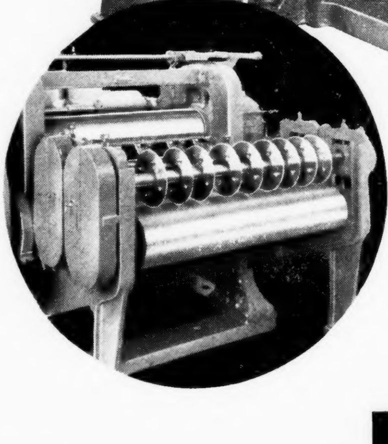
Although the operator works on the fixed roll of the mill, gauge control is no problem because the roll adjustment is motor-operated and push buttons provide the means for moving either roll end independently or both together.

Top roll adjustment for the calender is hand-operated by ratchet through worms and worm wheels. Calender equipment includes a water-cooled feed table and, on the take-off side, a blanking attachment which consists of a set of longitudinal knives and a set of adjustable circular knives.

Power for the entire assembly is supplied by a single two-speed motor driving the mill through a right angle reduction gear unit, with variable speed units transmitting power to the calender and to the conveyor which feeds the calender.

Write for complete information and engineering help on roll mills, calenders or other rubber and plastics processing units for standard or unusual applications.



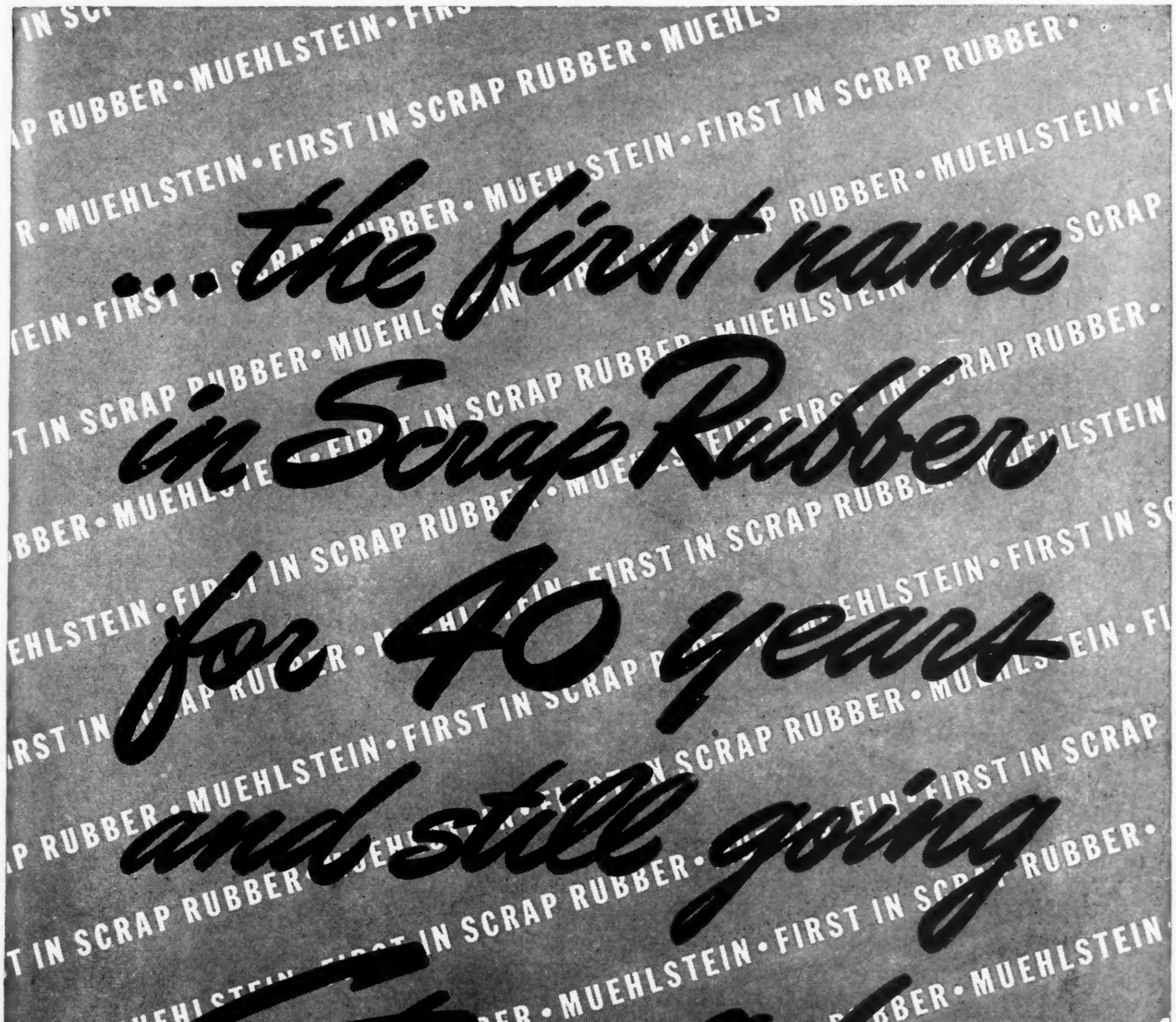


In operation, the mill receives stock directly from a Banbury mixer. After milling, the stock is delivered to the calender by conveyor. The sheet is brought to gauge and then deeply marked to blank size by two sets of knives attached to the take-off side of the calender.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, Stonington, New York, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston, Charlotte

Farrel-Birmingham



...the first name
in Scrap Rubber
for 40 years
and still going
Strong!
MUEHLSTEIN • FIRST IN SCRAP RUBBER
H. MUEHLSTEIN & CO.
INC.
122 EAST 42nd STREET, NEW YORK 17, N. Y.
BRANCH OFFICES: Akron • Chicago • Boston • Los Angeles • Memphis
WAREHOUSES: Jersey City • Akron • Boston • Los Angeles • Memphis

April, 1947

Volume 116 Number 1

A Bill Brothers Publication

INDIA
RUBBER WORLD
NATURAL & SYNTHETIC

Published monthly by Bill Brothers Publishing Corp. Office of publication, Orange, Conn. Editorial and executive offices, 386 Fourth Ave., New York 16, N. Y. Chairman of Board and Treasurer, Raymond Bill; President and General Manager, Edward Lyman Bill; Vice Presidents, Randolph Brown, B. Brittain Wilson, C. Ernest Lovejoy.

Subscription price—United States and Mexico, $3.00 per year; Canada, $4.00; all other countries, $5.00, as of July 1, 1947. Single copies, 35¢. Other Bill Publications are: GROCERGRAPHIC, PREMIUM PRACTICE, RUG PROFITS, FOUNTAIN SERVICE, TIRES Service Station, Sales Management.

A BILL BROTHERS PUBLICATION

ARTICLES

DEPARTMENTS

MARKET REVIEWS

STATISTICS

INDIA
RUBBER WORLD
NATURAL & SYNTHETIC

Volume 116 | New York, April, 1947 | Number 1

Natural Rubbers[1]—

A General Summary of Their Composition, Properties and Uses

Norman Bekkedahl[2]

DURING the period prior to World War II, 97% of the world's supply of natural rubber was obtained from the Far East. Consisting mostly of rubber from the botanical source, *Hevea brasiliensis,* this rubber was made up of estate rubber and remilled native rubber. The distinction between estate rubber and native rubber is essentially one of the size of the producing unit and usually the quality of the rubber produced. The estates are units of several hundred or thousand acres each, operated with substantial capital, and employing a large force which receives a cash wage. The native small holdings are units of a few acres each, owned and operated by native races in the Netherlands East Indies, and mostly by Chinese in Malaya. These small holdings occasionally employ outside labor on a share basis.

The estate rubber is usually cleaner and of better quality than that produced on the small holdings, but attempts have been made by the governments of the Far Eastern producing areas to teach the natives how to improve the quality of their rubber. Since the amount of rubber available during the postwar years will probably have a larger proportion of native rubber than ever before, it is expected that attempts to improve the quality and cleanliness of native rubber will receive increased attention.

During World War II the United States made very special efforts to increase the amount of rubber that could be obtained from South and Central America and from Africa. Although the increase was not so great as expected or desired, imports from these areas grew from about 18,000 tons in 1941 to more than 50,000 tons in 1945. As a result, many types of wild rubbers became known and used by more rubber compounders.

Beginning in June, 1941, and continuing through March 31, 1947, the Office of Rubber Reserve became the sole importer of natural rubber for the United States and also became the sole distributer of natural rubber to the rubber-goods manufacturing industry. The Rubber Trade Association of New York and its members acted as dealer-agents for the Office of Rubber Reserve from June 1, 1945, to March 31, 1947.

Plantation Rubber

Plantation rubber is obtained from the cultivated *Hevea brasiliensis* trees chiefly in the plantations of the Far East (Malaya, Netherlands East Indies, Ceylon, French Indo-China, Borneo, Siam, India, etc.) and to some extent in Tropical America and Liberia.

TYPES: The most common type of plantation rubber is the smoked sheet in its various grades. Alternative or specialized preparations are the crepe rubbers of various grades, fermented rubber, sprayed rubber, powdered rubber, softened rubber, formaldehyde rubber, deproteinized rubber, preserved latex, etc. As a war measure, which is still in existence at the time of this writing, a simplified system of grading places the smoked sheet and crepe rubbers into fewer classes. Most of the high-grade plantation rubber is coagulated from the latex by means of acetic or formic acids.

CHEMICAL COMPOSITION: A good grade of acid-coagulated plantation rubber has the following composition: rubber hydrocarbon (polyisoprene $(C_5H_8)_n$ cis-form), 93-94%; acetone extract (resins), 2-3%; proteins, 2-3%; ash, 0.2-0.5%; and moisture, 0.1-1.0%. The rubber hydrocarbon is made up of a mixture of long-chain molecules whose molecular weights range from about 100,000 to over 500,000.

CHEMICAL PROPERTIES: The presence of natural antioxidants retards oxidation of rubber and permits storage over a period of years without appreciable deterioration. The double bonds of the rubber hydrocarbon molecule are very reactive; vigorous agents such as the halogens, hydrogen halides, and sulfur chloride add readily. Reactions with relatively small molecular proportions of sulfur, selenium, thiuram disulfides, nitrocompounds, and certain peroxides lead to the formation of soft vulcanized rubber. Hard rubber (ebonite) is obtained by reaction with larger proportions of sulfur; the limiting composition is $(C_5H_8S)_n$. Rubber burns readily, evolving 10.8 calories per gram.

PHYSICAL PROPERTIES AND CONSTANTS: Plantation rubbers are non-toxic; their color varies from very pale amber to quite dark brown, depending on purity and on method of preparation. Density at 25° C. is 0.911-gram per cubic centimeter; volume expansivity, 0.000650 per

---

[1] Taken from second edition, "Compounding Ingredients for Rubber," available about May 1, 1947; published by India RUBBER WORLD.
[2] National Bureau of Standards, Washington, D. C.

degree Centigrade; and specific heat, 0.45-calorie per gram per degree Centigrade; Mooney viscosity (using large rotor and measuring after one minute of warm-up and four minutes of operation at 100° C.), about 80 Mooney units for top grades, with correspondingly lower values for average grades. Heat of fusion is four calories per gram; heat of combustion, 10.8 calories per gram; volume compressibility, 0.000054 per atmosphere; refractive index at 25° C., 1.5190; dielectric constant at 1,000 cycles per second, 2.37; and power factor at 1,000 cycles per second, 0.0016. Besides crystallizing upon stretching, rubber crystallizes in the unstretched state to a stiff and opaque material between about —50 to +15° C.; the rate of crystallization is dependent on temperature and most rapid at about —25° C., where it takes place in a few hours. The melting temperature depends on the temperature at which the crystals were formed. The second-order transition point is about —70° C., below which the rubber is brittle and glass-like. Rubber is soluble in carbon tetrachloride, chloroform, carbon disulfide, ether, and in hydrocarbon solvents such as benzene, gasoline, etc. It is insoluble in alcohols, acetone, and water.

COMPOUNDING: A good grade of natural rubber is better than any one of the present synthetics as a general-purpose rubber. It can be compounded in many different formulae in order to emphasize certain specific properties. However no compounds have yet been produced which can equal some of the qualities of the synthetic rubber vulcanizates, such as the gas-impermeability of the Butyl rubbers, or the oil resistance of the polysulfide, nitrile, or neoprene rubbers. Smoked sheet is employed in the manufacture of most rubber products, but for white or light-colored products, pale crepe is used. Where softer stocks are required, part of the high-grade rubber may be replaced by softer brown crepe. The rubber must be broken down mechanically or by heat treatment before the mixing operation begins. Both the breakdown and mixing operations may be performed either on the ordinary open-type mill or in a Banbury internal mixer. A suitable order of mixing the compounding ingredients is: (1) rubber, (2) plasticizers and softeners, (3) fillers, (4) accelerators, and (5) sulfur. Improper order of mixing may give poor dispersion or even scorching (premature vulcanization).

VULCANIZATES: Vulcanizates of natural rubber can be prepared so as to emphasize a large range of specific properties. The rubber may be vulcanized by means of sulfur or other agents, some of which have previously been mentioned in the section on chemical properties. Accelerators and accelerator-activators are usually used to aid the vulcanization reaction. Other compounding ingredients which may be added are protective, processing, reinforcing, loading, and coloring materials.

Soft vulcanizates of rubber exhibit crystallization when stretched. Vulcanization by means of sulfur prevents an unstretched rubber compound from crystallizing. Vulcanization by means of tetramethylthiuram disulfide (and probably also by other similar very low sulfur vulcanizing agents), with no other sulfur added, does not prevent crystallization in unstretched rubber, but does retard the rate.

The greater the amount of combined sulfur in the vulcanizate, the higher is the temperature of the second-order transition, which means that the brittle point is raised. Very high percentages of combined sulfur bring this brittle point up above room temperature, forming hard rubber or ebonite. At saturation (32% sulfur, or 47 parts per 100 of rubber), the transition is at about 80° C.

Vulcanizates of natural rubber are not very satisfactory for products which come in contact with oils, especially the petroleum products, because of deterioration by swelling and loss in tensile strength. Soft rubber vulcanizates have high tensile strengths, both when gum-compounded and when loaded with reinforcers. They show a high resistance to tear. The impact resilience of natural rubber vulcanizates at normal temperatures is superior to that of equivalent vulcanizates of synthetic rubbers. The heat build-up is low in comparison with that of synthetic rubber vulcanizates. They may not be so resistant to flex-cracking as some of the synthetic rubbers, but are superior to the most commonly used synthetic rubber compounds in their resistance to cut-growth. They exhibit a very low compression set. Their resistance to heat aging and to sunlight are not so good as for some of the synthetic rubber vulcanizates. The presence of copper or manganese, even in very small amounts, in natural rubber vulcanizates causes an increased rate of natural aging. Compounds of natural rubber burn quite readily unless they are compounded very heavily with non-combustible fillers.

The Division of Rubber Chemistry of the American Chemical Society in 1936 recommended a formula for the evaluation of plantation rubber. This recipe, now designated as A. C. S. — I, is as follows:

A. C. S. — I FORMULA	Parts
Rubber	100.0
Zinc oxide	6.0
Sulfur	3.5
Stearic acid	0.5
Mercaptobenzothiazole	0.5

GRADES: Grades of plantation rubber available from the Office of Rubber Reserve, Reconstruction Finance Corp., the central and only source of such rubber to rubber goods manufacturers during the war years and through March 31, 1947, together with official crude rubber-type descriptions of The Rubber Manufacturers' Association Inc., and endorsed by the Rubber Trade Association of New York, Inc., as of August 1, 1938, are as follows:

RIBBED SMOKED SHEETS

No. 1X RIBBED SMOKED SHEETS

Classed as superior-quality ribbed smoked sheets, European estates, by the RMA. Deliveries must conform to average quality represented by this sample. Shipments desired entirely free from mold, but very slight traces of dry wrapper and/or dry top and/or dry edge mold at time of delivery not to be objected to. The rubber must be dry, clean, strong, sound, evenly smoked, and patterned, and free from blemishes, specks, rust, and bubbles, or other foreign substances. Air dried sheets not tenderable against this type.

No. 1 RIBBED SMOKED SHEETS

Classed as standard-quality ribbed smoked sheets by the RMA. Deliveries must conform to average quality represented by this sample. Very slight traces of dry wrapper and/or dry top and/or dry edge mold permissible. Very slight traces of fine non-gritty carbon dust permissible. The rubber must be dry, clean, strong, sound, and free from foreign substances. The delivery may consist of European and/or Asiatic owned estate sheets. Air dried sheets not tenderable against this type.

No. 2 RIBBED SMOKED SHEETS

Classed as good fair average-quality ribbed smoked sheets by the RMA. Deliveries must conform to average quality represented by this sample. Slight rust and/or slight dry wrapper and/or dry top and/or dry edge and/or dry surface mold, not exceeding 5% permissible. Small bubbles and slight specks of bark, if scattered, not to be objected to. Rubber must be free of foreign substances and blemishes other than those specified as permissible. Air dried sheets not tenderable against this type.

No. 3 Ribbed Smoked Sheets
Classed as fair average-quality ribbed smoked sheets by the RMA. Deliveries must conform to average quality represented by this sample. Rust and/or dry wrapper and/or dry top and/or dry edge and/or dry surface mold, not exceeding 10%, permissible. Slight blemishes in color and/or small bubbles and/or small specks of bark permissible. Rubber must be free of foreign substances and blemishes other than those specified as permissible. Air dried sheets not tenderable against this type.

No. 4 Ribbed Smoked Sheets
Classed as low fair average-quality ribbed smoked sheets by the RMA. Deliveries must conform to average quality represented by this sample. Rust and/or dry wrapper and/or dry top and/or dry edge and/or dry surface mold, not exceeding 20% permissible. Translucent stains, bark specks, bubbles, slightly sticky, over-smoked rubber permissible. Virgin or under-cured rubber and/or wet mold and/or heated rubber not permissible. Rubber must be free of foreign sustances and blemishes other than those specified as permissible.

No. 5 Ribbed Smoked Sheets
Classed as inferior fair average-quality ribbed smoked sheets by the RMA. Deliveries must conform to average quality represented by this sample. Dry wrapper and/or dry top and/or dry edge and/or dry surface mold, not exceeding 30% permissible. Rust, stains, over-smoked rubber, slight under-cured rubber premissible. Sheets with large bark particles and/or slightly sticky rubber permissible. Rubber must be free of foreign substances and blemishes other than those specified as permissible.

THICK LATEX CREPES

No. 1X Thick Pale Latex Crepe
Classed as superior-quality thick pale latex crepe by the RMA. Deliveries must consist of firm rubber and conform to average quality represented by this sample. Dust, discoloration, specks, oil, or other stains and/or traces of copper or other foreign matter not permissible.

No. 1 Thick Pale Latex Crepe
Classed as standard-quality thick pale latex crepe by the RMA. Deliveries must consist of firm rubber and conform to average quality represented by this sample. Dust, discoloration, specks, oil or other stains, and/or traces of copper or other foreign matter not permissible.

No. 2 Thick Pale Latex Crepe
Classed as fair average-quality thick palish latex crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or streaks and/or traces of copper or other foreign substances not permissible.

No. 3 Thick Pale Latex Crepe
No classification given by the RMA.

THIN LATEX CREPES

No. 1X Thin Pale Latex Crepe
Classed as superior-quality thin pale latex crepe by the RMA. Deliveries must consist of firm rubber and conform to average quality represented by this sample. Dust, discoloration, specks, oil or other stains, or foreign matter not permissible.

No. 1 Thin Pale Latex Crepe
Classed as standard-quality thin pale latex crepe by the RMA. Deliveries must consist of firm rubber and conform to average quality represented by this sample. Dust, discoloration, specks, oil or other stains, or foreign matter not permissible.

No. 2 Thin Pale Latex Crepe
Classed as fair average-quality thin palish latex crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or streaks and/or traces of copper or other foreign substances not permissible.

No. 3 Thin Pale Latex Crepe
No classification given by the RMA.

THICK BROWN CREPES

No. 1X Thick Brown Crepe
Classed as clean, thick light-brown crepe, European estates, by the RMA. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 2X Thick Brown Crepe
Classed as clean, thick brown crepe, European estates, by the RMA. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 3X Thick Brown Crepe
Classed as brown to dark-brown thick specky crepe, European estates, by the RMA. Oil spots and/or heat spots and/or traces of copper or other foreign substances, except specks of bark, not permissible.

THIN BROWN CREPES

No. 1X Thin Brown Crepe
Classed as clean, thin light-brown crepe, European estates, by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 2X Thin Brown Crepe
Classed as clean, thin brown crepe, European estates, by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 3X Thin Brown Crepe
Classed as brown to dark-brown thin specky crepe, European estates, by the RMA. (This type is provided for by description only. No official type established.) Oil spots and/or heat spots and/or traces of copper or other foreign substances, except specks of bark, not permissible.

REMILLED CREPES

Thick Crepes

No. 1 Thick Remilled Blankets
Classed as superior, clean light-brown remilled blanket crepe by the RMA. (This type is provided for by description only. No official type established.) Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 2 Thick Remilled Blankets
Classed as clean light-brown remilled blanket crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 3 Thick Remilled Blankets
Classed as clean brown remilled blanket crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 4 Thick Remilled Blankets
Classed as brown to dark-brown remilled blanket crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

Thin Crepes

No. 1 Thin Brown Remilled Crepes
Classed as superior, clean, thin light-brown remilled crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 2 Thin Brown Remilled Crepes
Classed as clean, thin, light-brown remilled crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 3 Thin Brown Remilled Crepes
Classed as clean, thin brown remilled crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots and/or traces of copper or other foreign substances not permissible.

No. 4 Thin Brown Remilled Crepes
Classed as thin brown to dark-brown specky remilled crepe by the RMA. Deliveries must conform to average quality represented by this sample. Oil spots and/or heat spots

and/or traces of copper or other foreign substances not permissible.

ROLLED BROWN OR FLAT BARK
Classed as No. 1—Roll Brown Crepe and/or Flat Bark Crepe by the RMA. Cotton, sand, and other foreign matter, except fine bark particles, not permissible. Owing to rapid deterioration of this grade, no official RMA type-sample has been established.

NO. 1 SMOKED BLANKETS
No classification given by the RMA.

NO. 2 SMOKED BLANKETS
No classification given by the RMA.

NO. 3 SMOKED BLANKETS
No classification given by the RMA.

CLARO BRAND 1X RIBBED SMOKED SHEET
No classification given by the RMA.

NO. 1X RIBBED SMOKED SHEET TRIMMINGS
No classification given by the RMA.

SOLE CREPE TRIMMINGS
No classification given by the RMA.

NO. 1X THIN PALE CREPE TRIMMINGS
No classification given by the RMA.

RUBBER CULTUUR MATSCHAPPIJ, AMSTERDAM, WATERMARKED CREPE #16
No classification given by the RMA.

RUBBER CULTUUR MATSCHAPPIJ, AMSTERDAM, WATERMARKED CREPE #17
No classification given by the RMA.

RUBBER CULTUUR MATSCHAPPIJ, AMSTERDAM, WATERMARKED CREPE #18
No classification given by the RMA.

SOLE CREPE
No classification given by the RMA.

Wild Rubbers

SOURCE: Wild rubbers are obtained from uncultivated trees or other plants mostly indigenous to Tropical American and Africa. There are many species of plants which produce rubber, but the *Hevea* tree produces most of the wild rubber which finds commercial application. The *Hevea* tree has advantages over most other rubber-bearing plants in that it is easy to tap and produces a high yield of rubber of good quality.

TYPES: Wild rubbers are primarily classified as to the species of trees from which they are produced. Sometimes the rubbers are called by their botanical names (e. g., *Castilla*, *Cryptostegia*, etc.), and sometimes by the names of the localities from which they are produced or shipped (e. g., Para, Penambuco, etc.). A rubber produced by a certain species of tree may be subclassified as to its method of preparation (e. g., ball, sheet, etc.), or production location (e. g., Upriver, Islands, etc.).

CHEMICAL COMPOSITION: The rubber hydrocarbon of wild rubbers is the same as that of plantation rubber. There exist, however, great variations between the different types of wild rubber in the quality and quantity of the non-rubber constituents. Most of the wild rubbers have a high moisture content and, because of improper handling, contain a considerable amount of foreign substances such as woody material, dirt, bark, etc. Many of them contain a large percentage of acetone-extractible material, in some cases running as high as 25% and more. Sometimes these high-resin rubbers are extracted with alcohol or acetone, thus producing a "deresinated" rubber which is much lower in resin content.

CHEMICAL PROPERTIES: The chemical properties of wild rubbers are in general the same as those of plantation rubbers. However, where the non-rubber constituents of the wild rubbers are high, they may influence the vulcanizing reactions and consequently change the physical properties of the resulting vulcanizates.

PHYSICAL PROPERTIES AND CONSTANTS: For most practical purposes the physical properties and constants of wild rubbers are the same as those previously given for plantation rubber. In wild rubbers, however, there is considerable variation in the viscosity; this difference is largely caused by the variability in the acetone-extractible portions. A high resin content generally makes the rubber softer and therefore more difficult to wash.

COMPOUNDING: Because of the presence of large quantities of moisture and foreign material, practically all wild rubbers require washing and drying before compounding. The methods and formulae for compounding wild rubbers are usually not much different from those of plantation rubber. But in some of the wild rubbers there exists a deficiency of fatty acids which greatly decreases the rate of cure of the rubber. This deficiency in the rubber can be compensated for by the addition of extra quantities of activating agents or organic acids such as stearic acid. For comparative testing of the physical properties of wild rubbers, the Crude Rubber Committee of the Division of Rubber Chemistry of the American Chemical Society in 1944 recommended the following compounding formula, designated as A. C. S.-II, which has a higher stearic acid content than the A. C. S.-I formula used in comparing plantation rubbers:

A. C. S. — II FORMULA

	Parts
Rubber	100.0
Zinc oxide	6.0
Sulfur	3.5
Stearic acid	4.0
Mercaptobenzothiazole	0.5

In some cases where the resin content of wild rubber is very high, an extra quantity of sulfur may be required for vulcanization because some of the sulfur is used up in reacting with the resins. Some of the wild rubbers, especially those which have a high rubber hydrocarbon content, may be substituted wholly for plantation rubber. In other cases the wild rubbers produce such inferior products that their only use is in blending with plantation rubber or with better grades of wild rubber. Rubbers of high resin content usually have a tendency to stick to hot mill rolls, and the compounding must therefore be performed at a lower temperature.

VULCANIZATES: Vulcanizates prepared from some of the wild rubbers, especially from the clean and well-prepared smoke balls of *Hevea brasiliensis*, are equal to those prepared from plantation rubber; in some cases Para rubber is actually preferred by some manufacturers for certain purposes. The vulcanizates prepared from the wild rubbers having a higher resin content are generally softer, have less tensile strength, and sometimes are even sticky or tacky. For most purposes these high-resin wild rubbers are considered as low quality or inferior, but there are actual uses for which this softness and tackiness are to be preferred. Vulcanizates prepared from mixtures of high-quality and low-quality wild rubbers have properties intermediate between the vulcanizates prepared from the two independently. The low-quality rubbers therefore find their largest use in blending with rubbers of higher quality. "Deresinated" rubber produces vulcanizates whose properties approach those of the vulcanizates of plantation rubbers.

SPECIFIC RUBBERS: There are many species of wild rubbers, but only a very few of them have ever been produced on a commercial scale. The most common reasons for their unpopularity are either higher cost of production, inferior grade of rubber, or both. Only a few of the wild rubbers will be discussed here. All analyses reported are based on the washed and dried rubber.

PARA RUBBER: Para rubber is obtained from trees in the Amazon Valley, chiefly from the various species of the *Hevea*, which belong to the *Euphorbiaceae* family. Most of this wild rubber is coagulated from the latex

by smoking it on the end of a stick or paddle which is held over a smoky flame. Para rubber is one of the best grades of wild rubber, and if smoked carefully and kept clean, it is at least the equal of plantation smoked sheet. The better grades of Para rubber run up to 95% in rubber hydrocarbon, about 3% in resins, and about 2% in proteins. For the lower grades the resins increase in amount up to about 10%, with a corresponding decrease in the percentage of rubber hydrocarbon. All Para rubbers are placed in three grades, depending on the botanical source: (1) *fine* is the rubber from *H. brasiliensis* and *H. benthamiana*, (2) *weak fine* comes from *H. guyanensis*, and (3) *weak* rubber comes from other species of *Hevea*. They are also graded as to the care taken in preparation of the rubber. (1) *Hard fine Para* has had the greatest care in smoking and cleanliness; (2) *medium* has had less care in smoking which produces a spongy rubber; and (3) *coarse* includes *sernamby* rubbers, which have been allowed to coagulate spontaneously on the bark of the tree, in the containers, etc. The latter class includes all scrap rubber. Further classification of the Para rubbers gives the location in which they were produced, such as Upriver (indicating that the rubber came from the headwaters of the Amazon River), Islands (indicating that it was produced on or near the islands in the mouth of the Amazon), etc. An upriver fine Para rubber is a harder rubber and considered to be superior to islands fine Para. Para wild rubber is produced in many different forms, such as balls, crepe, smoked sheet, unsmoked sheet, biscuits, blocks, slabs, scrap, lump scum, etc. Practically all types must undergo washing and drying before they can be compounded and vulcanized.

GUAYULE RUBBER:[3] The guayule plant, *Parthenium argentatum*, is a shrubby herb of the *Compositae* family which grows wild in northern Mexico. It has also been cultivated experimentally in that same region and also in the southwestern part of the United States. The rubber produced by it is extracted mechanically by pulverizing the whole plant and floating off the rubber from an aqueous wash. The method does not produce so clean a rubber as plantation rubber. The rubber hydrocarbon content is relatively low, largely because of a high resin content in the rubber. The acetone-extractible portion of the Mexican wild guayule is usually between 20 and 25%. The acetone-soluble content of some experimentally cultivated domestic guayule was found to be about 16%. Guayule rubber has been "deresinated", reducing the acetone-solubles to about 6%. The rubber hydrocarbon content of the commercial resinous guayule rubber runs about 70%.

Guayule rubber is usually blended with higher-grade rubbers in the manufacture of rubber products, but, if deresinated, could be used alone for most articles. The mechanical processes involved in extracting the rubber from the guayule shrub result in a certain amount of breakdown, and less milling time is therefore required as compared to plantation rubber. Some users have adopted the practice of adding the guayule constituent of the mix after the plantation rubber constituent has been partially broken down. This practice avoids excessive tack resulting from over-milled guayule and at the same time retains the natural fluxing of guayule, making for a smooth-running stock. Also, since guayule has a naturally slow cure as compared to most plantation rubbers, the possibility of scorching is minimized.

The guayule vulcanizate is softer and has lower tensile properties than the corresponding plantation rubber vulcanizate. The lower the percentage of resins in the crude rubber, the better is the vulcanizate which can be produced. The high-resin guayule rubbers produce vulcanizates which may be quite tacky.

CASTILLOA RUBBER: This rubber is also known as *Caucho* or *Castilla* rubber. It comes from the Brazilian tree *Castilla ulei* or from the Central American tree *Castilla elastica* of the *Moraceae* family. The rubber is of high quality, but its production is very small because of a low yield and the difficulties involved in tapping the tree. Its acetone extract usually runs about 5%, and its rubber hydrocarbon content about 90%.

MANICOBA RUBBER: This rubber is also known as *Manihot* or *Ceara* rubber. It is produced by the *Manihot glaziovii* tree of the *Euphorbiaceae* family on the east coast of Brazil, and to some extent in Africa. This tree has an advantage over the *Hevea* in that it does not require so much rainfall or so good a soil, but the cost of production of the rubber is high because of a poor yield of rubber and difficulties in tapping. The rubber is of very good quality. The acetone extract generally runs about 5%, and the rubber hydrocarbon content about 88%.

MANGABEIRA RUBBER: This rubber is also known as Pernambuco rubber. It comes from the *Hancornia speciosa tree* which belongs to the *Apocyanaceae* family. The tree grows in the north, east, and south of Brazil, and even as far south as Paraguay. The rubber usually runs about 13% in resins and about 85% in rubber hydrocarbon. It is usually coagulated with alum or sodium chloride solutions which have a deleterious effect on the aging properties of the raw rubber and on its vulcanates. The tensile strengths of the vulcanizates are somewhat lower than those of the corresponding plantation rubber vulcanizates. For most purposes the *Mangabeira* rubber can be classed as an inferior grade of wild rubber.

RUSSIAN DANDELION RUBBER: This rubber, commonly called *kok-saghyz*, comes from the plant known as *Taraxacum kok-saghyz*. The plant is perennial and grows in colder climates than most rubber-bearing plants do. It is cultivated to quite an extent in Russia. The United States Government is studying its cultivation in several states, including Minnesota and Michigan. Most of the rubber exists in latex form in the roots of the plant. The acetone-soluble content of the rubber is about 5-7%, but this is not all resinous and does not cause a soft or weak vulcanizate. The benzene-insoluble material and the ash are abnormally high, but these insolubles are not objectionable since they are inert and act as fillers. The rubber hydrocarbon content is about 85%. Because of limited production in the United States, commercial evaluation of this rubber has not as yet been possible.

CRYPTOSTEGIA RUBBER: This rubber is produced by the *Cryptostegia grandiflora* vine which grows wild in Mexico. It also grows in Florida, Texas, Arizona, and California. During World War II a project was begun in Haiti cultivating the *Crytostegia* plant for rubber production, but it was later stopped because of high production costs. The rubber contains about 13% of resins and 83% of rubber hydrocarbon. It makes a fairly good vulcanizate, but is still a weaker rubber than the plantation rubbers.

FUNTUMIA RUBBER: This is the best known of the wild rubbers of Africa. It is produced by the *Funtumia elastica* tree. It has a resin content of about 8%, and a rubber hydrocarbon content of about 88%. Other African rubbers are *Landolphia and Clitandra*, both of which are produced by vines. Their acetone extracts and hydrocarbon contents run about the same in percentage com-

(Continued on page 70)

[3] Up to the present time practically all of this rubber has come from wild plants, but in the future much of it will probably come from plants under cultivation.

Recent Russian Literature on Natural and Synthetic Rubber—XXVI

M. Hoseh

THIS is the concluding installment of this series of abstracts on Russian literature on natural and synthetic rubbers which was started in the June, 1943, issue of India RUBBER WORLD. *Articles from the publication Kauchuk i Rezina for the years 1937 through 1940 were reviewed and apparently were of value to our readers since a considerable number of inquiries for further information were received.*

Publication of Kauchuk i Rezina was discontinued in Russia early in 1941 and to date has not been resumed. Publications other than this one containing information of interest to rubber chemists and technologists have been received more regularly during the past year or more. A survey of Russian literature on rubber which has appeared since January, 1946, is being made, and, if it is felt that the material would be of interest, a new series of abstracts may be published in the near future. We would appreciate any comment from readers of the series just completed as to the desirability of further material of this sort. EDITOR.

Plasticity of SK and Its Mixes. K. D. Bebris and I. Z. Lisogurskii, *Kauchuk i Rezina,* 11, 16-17 (1940). **SN-110.**

The formula of Karrer for calculating the plasticity of rubber is suitable for NK and its mixes, but is not applicable to SK and its mixes, according to this article.

Zinc Oxide as an Activator in SK Mixes. A. I. Zhitlovskaya, *Kauchuk i Rezina,* 11, 26-27 (1940). **S-68.**

The effectiveness of ZnO was tested in rod polymers and rodless polymers of SK. The experiments showed quite clearly that in SK rod polymers ZnO can be omitted. In mixes made with rodless polymers the results are not quite so obvious. The tensile strength, relative elongation, and set elongation were very similar whether ZnO was used or not. The main differences were observed in the hardness, extent of swelling in benzene, and in the plasticity after 60 minutes of boiling. Thus, mixes containing 7% and 2% of ZnO had a Shore hardness of 75 and 56, a swelling in benzene 30 and 67, and plasticity (after 60 minutes boiling) of 0.025 and 0.13, respectively.

Determination of Heat Generation in Rubber at Multiple Deformations. F. Bachulis, *Kauchuk i Rezina,* 12, 6-9 (1940). **SN-112.**

Heat generation in rubber specimens held between two metal plates was tested in a DeMattia apparatus. The parts of rubber adjacent to the metal heated more than the rubber in contact with air. Generally SK rubber heated more than NK. Under similar conditions the difference in heating was approximately 20° C. Along with freshly prepared specimens were also tested specimens of rubber 11 years old. There was no perceptible difference in the behavior of the two. Keeping rubber for eight months in a mineral oil did not affect its heating.

Acceleration of Vulcanization at High Temperatures. Part 2. A. P. Pisarenko, *Kauchuk i Rezina* 12, 9-12 (1940). **SN-113.**

The performance of thiuram accelerators, captax, DPG, and 808, was tested at 150, 175, 200, and 225° C. The accelerators were used in quantities half as great as ordinarily used. The activity of these accelerators was in no way impaired by the high temperatures. Regardless of the accelerator used, the tensile strength of the vulcanizate increased with the vulcanization temperature, but the elastic properties were affected adversely. Quite likely this adverse effect could be prevented by reducing the quantity of accelerator used still further. Vulcanization at 200-225° C. raised the tensile properties by 25-50% of the properties required by specification. Tried under production conditions, the time of vulcanization was reduced from 10-12 minutes to 2-3 minutes. The efficiency of plant equipment is thereby increased several-fold.

Resistance of Rubber to Tear. G. A. Patrik'eev and A. I. Mel'nikov, *Kauchuk i Rezina,* 12, 12-20 (1940). **SN-114.**

Specimens of SK and NK rubber were tested for their resistance to tear under various conditions. The factors investigated were: thickness of specimens, nature of cut, rate of pull, effect of additional cuts, degree of vulcanization, and composition. The resistance of tear increased with the thickness of the specimen. As the rate of pulling increased, the resistance to tear decreased. The angle at which the cut was made, i.e., the angle between the cut and the edge of the specimen, affected the resistance to tear considerably. The resistance of SK and NK specimens to tear depended on the depth of the cut. When the depth of cut was small, NK specimens had a markedly greater tear resistance than SK specimens. As the depth of cut increased, the difference in tear resistance of the two kinds of rubber diminished.

Dielectric Strength of Ebonite. G. Ya. Murav'eva, *Kauchuk i Rezina,* 12, 23-28 (1940). **SN-115.**

Five kinds of ebonite including filled and filler-free grades made of SK and NK rubber of various thicknesses were tested for their dielectric properties. Up to 30 seconds the breakthrough potential of ebonite drops as the time of exposure increases. After this, the rate of drop levels off and becomes asymptotic to the axis of time. The gradient of the breakthrough potential decreases rapidly as the thickness of the specimen increases. The greatest decrease of the gradient takes place as the thickness of the specimen increases from one to five millimeters. When the thickness increases from 18 to 30 millimeters, the gradient of the breakthrough potential is practically unaffected. Ebonite made from butadiene rubber fully equals NK ebonite in its dielectric properties. This applies to all thicknesses except one-millimeter sheets, in which case the dielectric strength of NK is by 30% higher that of butadiene ebonite.

Polychlorovinyl as Rubber Substitute. P. I. Pavlovich, *Kautchuk i Rezina,* 1940, 12, 29-34.-(1940). **S-69.**

(Continued on page 70)

The Use of Fatty Acids and Their Soaps in the Manufacture of Butadiene Synthetic Rubber[1]

W. L. Semon[2]

MOST people are not aware that the manufacture of soap has a direct bearing on the production of synthetic rubber; yet GR-S, the general-purpose American synthetic rubber, contains almost 6% of fatty acid derived from the soap used in the manufacturing operation. For instance, when more than 700,000 tons of GR-S are produced, as was the case in 1945, 110,000 000 pounds of soap are required, or 6% of the total amount made in this country. Moreover the soap that is used must be of the highest quality and must meet a rigid set of specifications. Both the quantity used and the quality of the soap are determined not by any whim of the manufacturer of the synthetic rubber, but rather by precise physical and chemical conditions that must be met in the manufacturing process.

First let us investigate what a synthetic rubber actually is and how it is made. A rubber may be pictured as a tangle of ultra-microscopic molecules several thousands of times as long as their cross-sectional diameter. In synthetic rubber these molecules are formed by polymerization, that is, by a process in which small simple molecules are joined together end to end much like links in a chain. This process of polymerization can occur, for example, when a liquid composed entirely of these simple molecules is treated with a catalyst that causes the polymerization process. This is known as mass polymerization since there is secured a block or mass of rubber which, however, is hard to remove from the container. Moreover the product is so viscous that it is practically impossible to stir it during the process; hence removal of the heat of polymerization is a serious problem. This process does not require soap and has not been used to any great extent for making synthetic rubber in this country. Nevertheless it was used by the Germans who made certain special rubbers such as Buna 85 or Buna 32 by this process.

An obvious improvement in the mass polymerization process would be to dissolve the monomer in an inert solvent so as to maintain lower viscosity and thus afford an opportunity for the removal of heat during polymerization. This process again requires no soap; nevertheless for it to operate economically, tremendous quantities of solvent must be recovered and reused. This process has been used in this country for the manufacture of GR-I, or Butyl, the synthetic rubber used to a considerable extent in the manufacture of inner tubes.

However a third possibility can be pictured: namely, emulsification of the monomer in an immiscible liquid such as water, followed by polymerization to give a latex composed of fine particles of rubber suspended in the solvent. This process avoids difficulty due to high viscosity of the water phase. Heat of polymerization can thus be easily removed, and there is no solvent recovery problem. This process requires an emulsifying agent such as soap and is the method by which the majority of American synthetic rubber is manufactured. When the monomer used is chloroprene, the rubber formed is known as GR-M, or neoprene. When the two monomers, butadiene and acrylonitrile, are polymerized together, there is formed a *nitrile* rubber known as GR-A, Perbunan, Chemigum, Butaprene, or Hycar OR. When, however, butadiene and styrene are polymerized together the product is known as GR-S, or American rubber.

The Function of Soap in Emulsion Polymerization

In emulsion polymerization both the water and the soap perform very definite functions. Most of the evidence supports the theory that polymer particles originate by the polymerization of monomer molecules dissolved in the aqueous phase or solubilized by the soap present. Polymer growth then continues at interfaces where soap is concentrated as micelles or sorbed on the surface of polymer particles. The following experiment shows simply initiation of polymerization in the water phase and not in the monomer phase. Thus, if a layer of acrylonitrile is poured into a tube over a 6% solution of potassium persulfate and allowed to stand at room temperature without agitation, the water layer soon becomes cloudy, owing to the formation of finely dispersed polymer. The interface between the two liquid layers remains perfectly clear as does also a zone of about five millimeters below the interface. Apparently acrylonitrile diffusing into the aqueous phase to replenish that removed by polymerization has had insufficient time to undergo polymerization during its diffusion through the upper portion of the aqueous phase.[3]

Another fact indicating that initiation of polymerization occurs in or adjacent to the water phase is the observation that water soluble initiators such as hydrogen peroxide, potassium persulfate or diazonium salts in the usual polymerization systems are much more effective initiators of emulsion polymerization than oil soluble materials such as benzoyl peroxide.

Soaps exert a profound effect upon the initiation and speed of polymerization; their efficiency is roughly in the same order as their solubilizing action[4] for the monomers.[5] Thus there are many synthetic detergents more efficient than fatty acids for emulsifying the monomers, yet of small value in initiating polymerization. Methyl cellulose[5] and other non-ionic emulsifying agents fall into this class.

The amount of monomer solubilized by a soap is always less than the weight of the agent causing this action; yet the total amount solubilized is roughly proportional to the soap content.[5] In emulsion polymerization the rate of polymerization is roughly proportional to the concentration of fatty soap. Thus, as shown by Harkins, Heller, *et al.*,[6] the amount of GR-S polymer formed from butadiene and styrene in six hours at 50° C. is as follows:

Concentration of soap in aqueous phase	0	1%	2%	3%	5%	7%
Conversion of monomers to polymer	Very small	10%	24%	34%	59%	76%

These two observations in conjunction afford evidence therefore that, other things being equal, the rate of polymerization is proportional to the monomer solubilization.

---

[1] Reprinted from *Oil and Soap*, Feb., 1947, p. 33.
[2] The B. F. Goodrich Co., Akron, O.
[3] C. F. Fryling and E. W. Harrington, *Ind. Eng. Chem.*, 36, 117 (1944).
[4] J. W. McBain and A. M. Soldate, *J. Am. Chem. Soc.*, 64, 1556 (1942).
[5] J. W. McBain, Private communication to Rubber Reserve, Mar. 22, 1943.
[6] Private communication to Rubber Reserve, June 24, 1943.

The soap therefore performs a much more basic function than merely emulsifying the monomer—it participates in the initiation of the polymerization and influences the emulsification of the resultant polymer. Thus if *vapor* of monomer is supplied to a solution of fatty acid soap even in the absence of agitation, polymerization and formation of an emulsion of polymer occur. In this case initiation of polymerization is a homogeneous process and cannot be attributed to activity at an interface beween liquid monomer and soap solution[3] since here there is no such interface.

Further, if a fatty acid soap solution containing polymerization catalyst is carefully introduced below a layer of monomer and allowed to stand without agitation, polymerization occurs, and the water layer becomes milky, owing to the formation of emulsified polymer in the water phase. Agitation and preemulsification, therefore, are not responsible for the formation of this emulsion.

In the absence of agitation, rate of diffusion of the monomer may be a limiting factor in the rate of polymerization. Agitation therefore is important because it breaks up the monomer, thereby furnishing a greater interface for the diffusion process. However in a stirred reactor even comparatively inefficient stirring may be sufficient to assure a maximum rate of polymerization and emulsification of polymer; more rapid stirring and better emulsification of monomer in this case have no effect upon the rate of polymerization. Preemulsification of the monomers in the soap solution in such cases would obviously be expected to have little effect upon the speed of polymerization.

The progress of emulsion polymerization may be summarized as follows including a number of concepts published by Harkins.[7] Polymerization of monomers starts in the micelles of soap, which in turn are rapidly depleted during the course of the polymerization since the polymer particles, as formed, adsorb a layer of soap from the water layer which in turn causes solution of the micelles. When a mass of polymer equal to roughly two to three times the mass of the soap has been formed, no micelles are left in the aqueous phase. There are then relatively few new particles formed, and polymerization continues on the polymer particles already present, causing an increase in their size. Monomer dissolves in and swells these particles so that long before polymerization is complete, no droplets of emulsified monomer remain. At the end of the polymerization relatively little soap is left in the water phase; so little, as a matter of fact, that the latex will scarcely foam. There is shown by surface tension measurements:[8]

	Surface Tension as Measured in Dynes/Cm at 28°C.*
Water used	74
0.1% soap solution	32
GR-S latex when 75% of monomers are polymerized	65-67

* By Du Noüy tensiometer — uncorrected.

Long before the completion of polymerization, due to depletion of soap in the aqueous phase the particles of polymer are only partially covered with soap, thus leaving an unsaturated surface. Latex of this type may be stabilized by adding more soap or some other surface active material to saturate the surface. In the usual manufacturing process it is not necessary to stabilize the particles since the latex is to be processed immediately for solid rubber.

[7] *J. Chem. Phys.*, 13, 381 (1945).
[8] E. A. Willson, Private communication.
[9] C. F. Fryling, Private communication to Rubber Reserve, May 21, 1942. G. R. Cuthbertson, W. S. Coe, J. L. Brady, *Ind. Eng. Chem.*, 38, 975 (1946).
[10] J. G. Hendricks, India Rubber World, 114, 60 (1946).
[11] Rubber Reserve Specification Limits for Soap.

The coagulation of synthetic rubber latex is quite similar to the coagulation of any soap stabilized emulsion. Addition of dilute acid or aluminum salt causes coagulation of the particles and conversion of the soap to fatty acid or aluminum soap. The curd so formed contains all the fatty acid originally present in the soap. Since fatty acid is a common compounding ingredient, in the manufacture of GR-S it is not extracted but left with the rubber. In some of the *nitrile* rubbers, fatty acid would be an undesirable ingredient; hence after coagulation the fatty acid is reconverted to soap with dilute alkali and washed from the crumbs. In either case the crumbs are washed with water, dried, and compressed into sheets or bales for commercial use.

Soaps have a remarkable and essential action in emulsion polymerization. Since *fatty acid* soaps are common and relatively cheap, they were used first in the manufacture of American synthetic rubber. However there are some disadvantages associated with the use of fatty acid soaps. GR-S containing fatty acid is not so tacky as might be desired, and certain finished articles made from it have undesirable properties that might be avoided if fatty acid were absent. To meet these needs GR-S has been made using the sodium salt of specially purified disproportionated rosin acid.[9] This synthetic rubber known as GR-S-10 imparts greater tack to unvulcanized rubber stocks made from it and thus makes building and assembling operations easier. The vulcanized rubber products also show appreciably better service properties.[10]

Specialty synthetic rubbers with other desirable characteristics can be made using certain cationic emulsifying agents. Salts of dodecyl amine and of diethylaminoethyl oleamide, for instance, can be used; however both of these materials start with fatty acids in their preparation.

Certain sulfonate dispersing agents such as the higher alkyl benzene sulfonates and condensed alkyl naphthalene sulfonates have shown value when used in small amounts for they stabilize the latex and prevent build-up of deposits in the reactors and on the containers.

Value of Specific Soaps of Fatty Acids

Now that the function of soap in emulsion polymerization has been described, let us compare specifically the different types of soap, the effect of composition and purity.

In order to obtain uniform results the soaps must be pure and clean. Freedom from "dirt" is, of course, important. However, a number of specific impurities may be much more harmful than "dirt," i. e., undissolved non-soap materials. Foremost among these must be mentioned contamination with metallic salts or soaps such as those of iron, copper, or manganese. While the amount that can be tolerated for storage stability and for threshold of inhibition of polymerization varies considerably, nevertheless the specification limits for iron—30 ppm, copper—10, ppm and manganese—2 ppm, have proved satisfactory in practice.[11]

Inhibiters are present in certain fats and oils. These cause difficulty by giving slow and variable rates of polymerization. To be avoided are both natural inhibiters and synthetic ones, such as alpha-naphthol, which are occasionally present or added to retard rancidifying of the oil or fat.

A wide range of fatty acids can be utilized for making soaps for use in the emulsion polymerization process. If sodium soaps of the specific pure acids are investigated, it is found that the lowest member that gives a reasonable rate of polymerization is sodium undecylate. The comparative value of the sodium soaps of the com-

mon specific fatty acids in making GR-S at 50° C. can be shown in the following table:[12]

Sodium Soap of	% Conversion of Monomers to Polymer in 12 Hrs. at 50° C.
Lauric acid	71
Myristic acid	75
Palmitic acid	83
Stearic acid	82
Oleic acid	8[illegible]
Elaidic acid	81
Palmitic acid 90% / Linoleic acid 10%	72
Palmitic acid 90% / Linolenic acid 10%	41
USP "oleic acid"	(*40) to 60
Mixed hydrogenated tallow acids	80

* Variable

It should be noted that in this case the activity holds up well with the higher acids being satisfactory even with arachidic and behenic acid soaps.

In the preparation of nitrile rubbers at 30° C.[13] the peak is at the myristate; activity falls off appreciably with the higher soaps.

Sodium Soap of	Rate of Polymerization
Lauric acid	Good
Myristic acid	Excellent
Palmitic acid	Good
Stearic acid	Fair
Oleic acid	Excellent
Linoleic acid	Inactive
Linolenic acid	Inactive
Mixture of palmitic, stearic, oleic acids	Excellent
Mixtures containing linoleic acid	Poor

Special attention should be directed to the harmful effect of linoleic, linolenic, and other highly unsaturated non-conjugated acids if present in soaps to be used in emulsion polymerization. The harmful effect has been shown quantitatively by Pfau and Wilson.[12] In the polymerization of GR-S at 50° C. each 1% of the polyunsaturated acid present causes a decrease in yield at the end of 12 hours as follows:

For	%
Linoleic acid	1.4
Linolenic acid	4.5

Methods for estimating polyunsaturation therefore are extremely important in maintaining quality and uniformity. The difference between iodine number and thiocyanogen number has been used as a measure of polyunsaturation. However by use of an ultra violet spectrophotometer it is possible to determine rapidly not only the extent, but the kind of polyunsaturation. This instrument is now used for production control of hydrogenation and also to check purchase specifications set up to insure uniform high activity of the soap used in making GR-S.[14]

As might be expected based on the micellar action of the soaps, the lower members are more satisfactory for polymerizations to be run at lower temperatures, while the higher members show better solubility and activity at the higher temperatures. The trend is definitely toward polymerization at lower temperatures, for the majority of the evidence shows that in any given recipe the lower the temperature at which the polymerization is performed, the higher the quality of the rubber. This would indicate a future trend toward soaps with high myristic acid or recrystallized oleic acid content or wider use of the more soluble potassium soaps.

In certain hydrogen peroxide initiated polymerizations such as are used in the manufacture of nitrile rubber, superfatting of the soap has a profound effect upon the speed of polymerization. This is shown in Figure 1 in

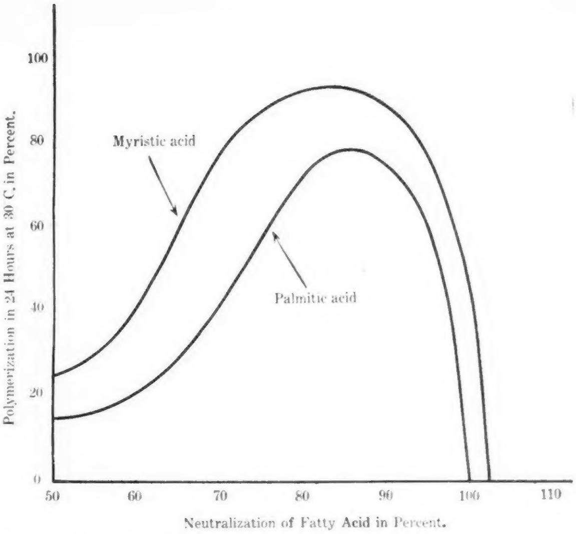


Fig. 1. Effect of Degree of Neutralization upon Conversion of Hydrogen Peroxide Initiated Nitrile Rubber

a nitrile rubber polymerization run at 30° C.[15]

Obviously when such a polymerization is performed, from 10 to 15% of the fatty acid in the soap should not be saponified. This result can be obtained either by adding fatty acid to the neutral soap or by adding a strong acid such as sulfuric to the soap solution to set free some of the fatty acid.

On the other hand an excess of alkali in the soap yields more stable latices. Recently polymerization recipes have been developed such that rapid polymerization can be obtained even in the presence of as much as a 10% excess of alkali.

Special recipes for making emulsion polymers have also been developed for use where high-grade fatty acids are not available. Thus, as a result of their shortage of fats and oils during the war, the Germans used a linseed oil soap in the manufacture of Buna. This actually served a dual function; yet it did greatly slow down their production. Later when even this became unavailable, they used synthetic fatty acid prepared by the oxidation of Fischer Tropsch paraffin.

Research work in this country has shown that synthetic rubber can be made from polyunsaturated acids and other low-grade fatty acids at present production rates if special activators are used to compensate for the inhibiting effects. However these types of rubber have never been tested extensively on a commercial scale and do introduce a number of new difficulties into the manufacturing operations.

Trends in the Manufacture of Soaps for Use in Making Synthetic Rubber

There has been a noticeable trend in the fatty acids or soaps used in the manufacture of synthetic rubber. At first distilled myristic and palmitic acid from spermaceti was used. This was replaced soon by distilled myristic acid from coconut fatty acids. When the supply of this became short, soap made from selectively hydrogenated tallows and greases was used. Large-scale manufacture of GR-S necessitated larger quantities of soap. This was obtained first from high-grade edible tallow and finally from hydrogenated oils, tallow, and greases.

Future developments point to the use of highly puri-

(Continued on page 132)

[12] E. S. Pfau, J. W. Wilson, *et al.*, Apr. to Nov., 1943. Private communication to Rubber Reserve, Mar. 13, 1944.
[13] W. L. Semon, private communication, Mar., 1941.
[14] 1945 Report of Bureau of Ag. & Ind. Chem., United States Department of Agriculture. Rubber Age (N. Y.), 59, 198 (1946).
[15] C. F. Fryling, U. S. patent No. 2,366,325, Jan. 2, 1945, assigned to B. F. Goodrich Co.

Synthetic Latices—A Summary[1]

L. A. Wohler[2]

STRICTLY speaking, "latex" is the botanical term used to designate the milky substance found in certain plants; the most important of these to the rubber industry is that of the *Hevea brasiliensis* tree. The use of the term "latex" has been broadened in recent years to include the water dispersions of many kinds of elastomers, plastics, and resins, produced by emulsion polymerization. By variation in monomers, emulsification systems, and conditions of polymerization an almost unlimited number of synthetic latices is possible. This is in startling contrast to the former situation when only a few variations of natural latex were available.

Synthetic latices should be here distinguished from artificial latices which are considered as being water dispersions made from the solid state of such materials as rubber, natural or synthetic, reclaimed rubber, plastics, or resins.

Space here permits consideration only of those synthetic elastomer latices which have attained the most prominent commercial importance: namely, latices from copolymers of butadiene and styrene, copolymers of butadiene and acrylonitrile, polymers of chloroprene and polyethylenepolysulfide.

Although exceptions can be found, synthetic latices have many common colloidal properties by which they can be compared with *Hevea* latex. Generally, both *Hevea* and synthetic latices can be described as stabilized suspensions of microscopic negatively charged hydrocarbon particles small enough to exhibit Brownian motion. In contrast to *Hevea* latex which is stabilized with naturally occurring protein, synthetic latices are usually stabilized with alkali soaps or other surface active agents. These differences in stabilizers have important bearing on differences in properties of the two types of latex.

Both types exhibit structural viscosity characteristic of colloidal systems and are coagulated by acids, multivalent metallic ions, and certain organic solvents. The synthetic varieties are much more stable to mechanical agitation than *Hevea* latex. Chemical stability is influenced by so many individual factors that a direct comparison cannot be conveniently made. However it is sufficient to say that the chemical stability of the synthetic latices is high enough to render them satisfactory for compounding and use in the latex process.

In general, the particles of synthetic latices are smaller and more uniform in size than those of the natural latex, being in the range of 0.1-micron in diameter. However, recent polymerization techniques have introduced a measure of particle size control so that, to a degree, latices of predetermined particle size can be made. The smaller particle sizes of synthetic latex affect their viscosity and other properties. Synthetic latices are therefore less susceptible to spontaneous creaming or settling than *Hevea* and by the same token do not lend themselves to commercial centrifugal concentration,

The Author

although the viscosity of the concentrate and differences in gravity between the polymer and serum phases are important additional factors.

In compounding consideration must also be taken of the higher adsorption of surface active materials on the small particles of synthetic latices. The high adsorption of stabilizers by the synthetic latices must also be taken into consideration in making blends as with *Hevea* latex. Cases have been observed where the high adsorption tendencies of the synthetic phase have destabilized and coagulated the compound. Theoretically, the smaller synthetic latex particles should give better impregnation of fibers.

Until recently synthetic latices were usually produced in concentrations from 25% to 50% total solids. Higher concentrations were produced by evaporation or by creaming with ammonium alginate or similar materials. By creaming, concentrates approaching 60% total solids can be obtained; while by evaporation, creams considerably in excess of 60% are being produced commercially.

Recent advances in polymerization techniques have made it possible to produce several latices at high solids contents directly in the reactor, and it is probable that except for unusually high solids contents most synthetic latices will eventually be polymerized at concentrations high enough for direct use, thus eliminating the supplementary concentration step entirely.

Most synthetic latices show slower drying characteristics and higher water absorption than *Hevea* because of their high soap content.

For practically all of the processes normally employing natural latex one or more of the synthetic types has been adapted with some degree of success. This applies to processes employing casting, spreading, spraying, dipping, electro deposition, extrusion, foaming, impregnation, and gelation.

The degree to which the synthetic latices are adaptable to latex processes are to a great extent dependent on their ability to form tough, coherent, and elastic gels and films, as is the case with *Hevea* latex. In general, nearness of the approach of synthetic latices to perform this function is a measure of their adaptability to existing latex processes.

The physical and chemical properties of the films formed from the synthetic latices follow roughly the characteristics of the pure gum milled film of the same polymer. As with *Hevea*, reinforcing-type pigments do not reinforce synthetic latex films except in some very special cases.

[1] Taken from second edition of "Compounding Ingredients for Rubber" to be published about May 1, 1947, by India Rubber World.
[2] Firestone Tire & Rubber Co., Akron, O.

Considering the relatively short time during which intensive effort has been centered on synthetic latex, the progress has been remarkable. Continued research will undoubtedly produce synthetic latex equal or superior to the natural varieties. With the unlimited possibility of tailor making latices to fit specific uses, advantages can be taken of the properties of special synthetic rubbers such as solvent resistance, resistance to deterioration by aging, and fire resistance as well as other properties still unknown resulting from introduction of entirely new polymers.

Neoprene Latices (Polymerized Chloroprene)

Neoprene latex was one of the first synthetic latices to become commercially available, having been introduced to the trade in 1932. We, therefore, have much more complete information on this type than on the other synthetics. Neoprene latex, of which about five or six different types are now available, have good film and gel strength and therefore have found application in a wide field of latex technology. Although these latices were originally introduced as a specialty latex, the wartime shortage of natural latex has brought them into much general-purpose use.

Neoprene latices are available concentrations of 50 and 60% solids content. They are stable dispersions of polymerized chloroprene having a negatively charged particle in the range of 0.1-micron in diameter. Because of their small size these particles show Brownian motion and do not settle out in spite of their high specific gravity (1.25).

For the most part neoprene latices can be handled by methods common to general latex practice. The same procedures as used with natural latex slightly modified to suit the neoprene conditions are satisfactory.

The outstanding properties of neoprene films are their good gel and film strength coupled with good age, sunlight, fire, and solvent resistance. Neoprene films show a tendency to stiffen on standing, but can be restored to their former resilience by rewarming. Neoprene films stiffen at low temperatures and show decreased tensile and tear resistance at elevated temperatures. They darken during cure. Ultra-accelerators are not effective in neoprene stocks; therefore, low-temperature high-speed uses are not adaptable as with natural latex. Cures consequently are usually made at higher temperatures.

Neoprene latex films require the presence of a metallic oxide, usually zinc oxide, and an antioxidant for proper cure. Sulfur is not essential, but is sometimes used. Only antioxidants recommended specifically for neoprene should be used, as those effective in rubber are not necessarily effective in neoprene. Because of the tendency for chloroprene to evolve small amounts of hydrogen chloride during aging, the presence of an acid acceptor such as zinc oxide or other alkaline substance is essential in neoprene compounds especially for use in contact with fabrics. If light-colored stocks are desired titanium dioxide or other white pigment must be added to the base compound. Fillers, softeners, and thickening agents are handled in approximately the same manner and perform similar functions as with natural latex.

Among the many applications of neoprene latex are extruded thread, foamed sponge, adhesives, dipped goods such as gloves, bladders, wire baskets, also impregnated and coated fabrics and papers as well as fabric and rug backings.

GR-S Latices (Butadiene-Styrene Copolymers)

Although latices of copolymers of butadiene and styrene have been in existence for some time, they did not attain any wide usage until curtailment of natural latex supplies and the development of the government rubber program brought about by wartime conditions. These latices are produced in the government plants and became generally available in this country in 1944 and 1945 although they had been known and used abroad for several years. The first types were not made up especially for latex use, but were latices from the regular production of GR-S rubber before the coagulation step. Later types were made up especially for latex users. Because the GR-S latices have been available for such a short time, our information on them is not very complete.

Butadiene-styrene copolymer latices are of particular interest from the economic standpoint since their low pound price coupled with low specific gravity give them a considerable cost advantage over the other synthetic latices. Although the strength of products made from these types is still in general quite low, their economic advantages provide a strong incentive for researchers to improve their strength characteristics to take advantage of their low cost.

GR S Latex, Type I

Type I, GR-S latex is the emulsion of polymerized butadiene and styrene made as a step in the production of GR-S synthetic rubber. The polymer, therefore, has a butadiene-styrene ratio of about 75:25 and contains an antioxidant of the staining type.

This latex is emulsified with fatty acid soap and has a total solids of about 27%. The particles are in the range of 0.07-micron in diameter, and because of their small size are in Brownian motion and do not cream even though the gravity of the particles is low (0.94). The particles are negatively charged, and the latex lends itself therefore to compounding with the same type of dispersion as used with *Hevea* latex.

Type I latex forms very weak gels and films which have a tendency to crack during drying. Because of these properties its application in latex processes has been very limited. Films of Type I latex have in general the properties of milled GR-S pure gum films. They are dark in color, show low tensile and tear strength, are slow drying, and have high water absorption. They also have good low-temperature properties and aging properties and poor solvent resistance.

Type I latex stocks are slightly slower in cure rate than *Hevea*, but lend themselves satisfactorily to ultra-acceleration and low temperature cures. Although reinforcement of latex stocks with colloidal materials is generally not considered feasible, a definite reinforcement of Type I latex stock has been indicated by use of certain carbon blacks and fine organic and inorganic pigments.

Because of the low physical properties of its films, Type I latex has not found wide application in latex processes. Thus far it has found some application in tire cord dips, fiber binding, and impregnation.

GR-S Latex, Type II

Type II latex differs from Type I only in that the antioxidant has been omitted, thus allowing the compounder to select the best one for his own particular need. Because of the elimination of the staining type of antioxidant, Type II films are light in color; otherwise its properties are the same as those of Type I latex.

GR-S Latex, Type III

Type III was produced specifically as a latex for general-purpose use and shows advantage over Types I and

II in many ways. In Type III latex the butadiene-styrene has been increased to a 50:50 ratio; the emulsifier has been changed to a rosin soap, and the polymerization has been carried to a higher state. The gels and film strength of Type III latex are greatly improved over Types I and II. Therefore this latex lends itself to a much wider field of application than the others and has in many ways served as a general-purpose latex.

Type III is a stable emulsion of butadiene-styrene having a total solids content of approximately 38%. Its particles are negatively charged and because of their small size (0.07-micron) show Brownian motion and little tendency to cream. This type can be handled by methods common to latex practice. It lends itself readily to concentration by creaming or evaporation. Creams using ammonium alginate-type of creaming agent are available at greater than 50% T.S., while evaporated concentrates above 50% T.S. are available commercially.

Type III latex films are light in color and, when properly compounded, have good age resistance. They stiffen markedly at low temperatures and show decreased tensile and tear strength at elevated temperatures. Films are relatively slow drying and high in water absorption.

Type III films require the same general type of compounding for cure as *Hevea*. As some of the ultra-accelerators function satisfactorily in Type III, this latex lends itself to low-temperature fast cures generally used in latex processes. Thickeners, softeners, stabilizers, and fillers perform, in general, the same function as with *Hevea*.

Among the many applications of Type III latex are cord dips, for tires or belting, adhesives, paper and fabric saturants, curled hair binders, coatings, can sealants, rug and fabric backings, and dipped goods.

Miscellaneous GR-S Latices

Although Types I, II, and III are the only GR-S-type latices considered here in any detail, many other new general as well as special types are becoming available. Some of these latices which are being produced in government plants might be mentioned here, although this list should not be considered complete.

GR-S Latex Type IV. Type IV latex is similar to Type III latex except that it is produced at 39-45% solids content.

GR-S Latex Type V. Type V latex is a high solids latex (55-60%) having a 70:30 butadiene-styrene ratio and a mixed fatty acid and rosin soap emulsifier. It is especially adapted to the manufacture of foamed latex sponge.

GR-S Experimental Types. X-270 and X-359 latices are general-purpose types similar to Type III and Type IV except that they are produced at 50-60% solids content. In addition the X-359 has a slightly lower styrene content; the butadiene-styrene ratio 55:45 in place of the 50:50 as with Type III and IV and X-270.

X-293 is a low solids (26-28%) latex somewhat similar to Type I except that it has been more highly modified to give very soft films. It finds special application in adhesives.

X-288 and X-333 are high solids latices (55%) especially adaptable to the manufacture of foamed sponge. They have a butadiene-styrene ratio of 70:30. The X-288 has a fatty acid soap emulsifier; while the X-333 is emulsified with a mixture of rosin and fatty acid soaps.

X-342 latex is a low solids latex (25-31%) having a butadiene-styrene ratio of 75:25 and a mixed fatty acid-rosin soap emulsifier. This latex was developed especially for tire cord dip.

Buna N Latices (Butadiene-Acrylonitrile Copolymers)

As with Type I GR-S latex, the first Buna N latices (hereafter referred to as "nitrile type") were made available as a step in the emulsion polymerization process for the production of solid butadiene-acrylonitrile copolymer, but later on were made up specifically for latex users. These latices are produced in privately owned plants and exist in a number of variations. Since they have been available for only a short time and have come into general use, not much information is available on their properties and uses. They have apparently been more widely used abroad where their high cost has not been so much of a factor.

Nitrile type latices at present could best be designated as special-purpose latices with a very high solvent resistance as the most outstanding characteristic of their films. They are stable water dispersions of butadiene-acrylonitrile copolymer usually, but not necessarily, in an alkali soap stabilized system. As with most other synthetic latices, they are composed of small (approximately 0.07-micron) negatively charged particles in Brownian motion. There is little tendency to cream because of the small particle size and small difference in specific gravity between the solid and serum phases. Being anionic systems, these latices are handled in much the same manner as *Hevea* and other synthetics with regard to type of dispersions used for compounding and also methods of processing.

Nitrile type latices are available in different emulsification systems, solids contents and variations in acrylonitrile content of the polymer itself.

Films from nitrile type latices show general greater gel and film strength than the films of equivalent GR-S latices. Films may be light colored or darken on use, depending on the type of antioxidant used in manufacture. The solvent resistance which is higher than other synthetic latices is a function of the acrylonitrile content; high acrylonitrile gives the best solvent resistance. Nitrile type films have a tendency to stiffen markedly at low temperatures. Here again, the stiffening is proportionate to the acryonitrile content; high acrylonitrile gives the greater stiffening.

Compounding follows the general line of *Hevea* rubber compounding, fillers, thickeners and stabilizers all performing similar functions. Ultra-accelerators are effective in nitrile type latices; therefore low-temperature fast cures may be used.

Nitrile type latices have found application in adhesives, paper and fabric impregnation and coating, foamed sponge, and dipped goods.

"Thiokol" Latex (Polyethylene-Polysulfide)

"Thiokol" latex is another water dispersion of a rubberlike material which has seen a limited special purpose application. The properties of this latex and its films are considerably different from any described this far. This latex is a stabilized dispersion of polyethylene polysulfide of relatively large particle size (four to eight microns). Because of the large particle size coupled with high specific gravity of the polymer (1.5) rapid settling takes place on standing. Concentrates of 65-70% can be readily obtained by simple settling and decantation of the serum.

This latex can be coagulated with strong acids, but in application usually calls for drying methods only. The outstanding property of "Thiokol" films is their remarkable resistance to most organic solvents and chem-

(*Continued on page* 120)

Vibration Fatigue of GR-S in the Goodrich Flexometer

M. C. Throdahl[1]

THIS note on the vibration fatigue of two GR-S stocks obtained using the Goodrich flexometer is submitted as a further bit of contributing information on the problem of hysteresis measurement. The recent review of hysteresis and its measurement by Dillon and Gehman[2] indicated that present methods are not without numerous faults—especially in the non-resonance forced vibration type. But, perhaps, by adjustment of operating conditions results more applicable to interpretation can be obtained. It is with this thought in mind that these results are offered.

This study was made to learn something of the vibration fatigue characteristics of a GR-S stock vulcanized with sulfur and with ethyl xanthogen disulfide at both under and optimum cures. Normally tests conducted in the Goodrich flexometer are concluded when specimens have reached equilibrium conditions—usually in 30 minutes or less. Lessig's original paper[3] showed temperatures of *Hevea* stocks up to three hours' running time, but the literature does not contain information on behavior for longer periods. It was desired to run all the stocks to failure, if possible.

TABLE 1. STOCK COMPOSITION

	1	2
GR-S (Institute, W. Va.)	100.0	100.0
EPC black*	40.0	40.0
Zinc oxide	3.0	3.0
Softener†	8.0	8.0
Cyclohexyl-2-benzothiazole sulfenamide	1.2	2.0
Sulfur	1.75	....
Ethyl xanthogen disulfide	....	4.0

*Kosmobile 77.
†Paraflux.
Vulcanizing conditions: 30 and 90 min. at 142° C.

TABLE 2. TENSILE STRESS-STRAIN DATA OF VULCANIZATES

Stock	Condition	Cure in Min. @ 142° C.	Shore "A" Hardness	300% Modulus in Lb./In.²	Ultimate Tensile Strength in Lb./In.²	Ultimate Elongation in %
1	Unaged	30	55	420	2080	740
	Aged		67	1405	2160	420
1	Unaged	90	57	825	2760	600
	Aged		65	1150	2050	350
2	Unaged	30	53	385	2320	795
	Aged		60	870	3100	650
2	Unaged	90	56	700	3120	680
	Aged		60	1140	3080	650

Results

Data are tabulated in Tables 1-4. These show that an increase in amplitude causes rapid failure especially in the undercured stocks. The 90-minute cure on the ethyl xanthogen disulfide stock withstood vibration much longer than did its corresponding sulfur stock at the 0.200-inch amplitude. On the other hand the ethyl xanthogen disulfide stocks, in general, were poorer in this respect at 0.175-inch amplitude—especially in the low cure. Very little could be learned from the compression data. It would seem that predictions made from results at the 0.5-hour point in the test are not wholly reliable. Sulfur stocks at 0.175-inch amplitude ran for 56 hours with no apparent sign of failure. (The tests were stopped at this point). Aging of the stocks had the usual influence of "tightening" the undercured ones, which allowed them to run at "equilibrium" longer.

TABLE 3. VIBRATION DATA — STOCK 1

	30-Minute Cure				90-Minute Cure			
	Amplitude				Amplitude			
	0.175-Inch		0.200-Inch		0.175-Inch		0.200-Inch	
	Unaged	Aged	Unaged	Aged	Unaged	Aged	Unaged	Aged
Initial static comp.*	50.7	29.7	47.2	33.5	32.1	29.5	37.7	31.5
Initial dynamic comp.*	41.0	21.9	37.6	22.5	25.3	21.2	30.0	23.5
Final dynamic comp.*	55.6	32.6	54.3	40.4	37.8	47.0	47.4	39.0
Final static comp.*	66.7	42.0	67.7	60.0	50.0	37.5	50.0	49.1
H during Flexure†	+16.0	+12.3	+20.5	+26.5	+17.9	+8.0	+12.3	+17.6
Vibration Time — Hours					60‡	102‡	62‡	64‡
0.083	84‡	55‡	94‡	60‡	76	102	76	68
0.166	104	62	113	72	79	102	80	68
0.250	111	62	125	82	80	102	83	69
0.333	113	63	128	85	80	102	86	70
0.416	118	63	130	88	80	102	88	70
0.500	120	63	138	92	80	102	89	70
0.583	122	63	147¶	94	80	102	91	70
0.667	123	63		97	80	102	92	71
0.750	123	63		104	81	102	94	71
0.833	123	64		107	81	102	96	72
1.0	123	64		124	83	102	111	74
2.0	127	64		147**	84	102	118	76
3.0	133	64			85	102	123	78
4.0	130	65			86	102	125	79
5.0	129	66			86	102	126§§	80
6.0	128	67			87	102		82
7.0	126	68			87	102		83
8.0	122	68			88	102		84
9.0	118	69			89	104		84
12.0	118	72			90	107		84
14.0	115	70			90	108		84
16.0	115	70			91	108		84
18.0	113	70			92	108		84
20.0	112	70			93	108		85
23.0	112§	71			94	108		86
24.0		71‖			106	108		90
28.0					116	110		94
32.0					119	96		94
36.0					120	97		92
40.0					120	97		91‖‖
44.0					121	97		
48.0					122	97		
52.0					122††	97††		
56.0								

*% compression.
†% change in height.
‡Temperature in °C.
§Specimen cracked in eight hours, but continued fairly smoothly until 23 hours when vibration was too severe to permit running.
‖Specimens ran smoothly during entire run. No internal failure.
¶Specimens cracked at 0.333-hour; temperature rose rapidly and specimen burst at 0.583-hour.
**Specimen vibrated very badly at two hours. No cracking was observed.
††Specimen ran smoothly 25 hours when a small crack developed. This did not interfere with smooth operation during entire running time. No internal failure.
‡‡Abrupt rise to equilibrium temperature. Specimen ran smoothly, and no internal failure was observed.
§§Specimen vibrated very badly at six hours, necessitating removal. Later inspection showed internal degradation in center.
‖‖Normal smooth operation. No internal failure.

[1] Monsanto Chemical Co., Nitro, W. Va.
[2] India RUBBER WORLD, 115, 61 and 217 (1946).
[3] *Ind. Eng. Chem.* (*Anal. Ed.*), 9, 582 (1937).

Experimental

The stocks shown in Table 1 were mixed in the usual manner on a six-inch by 12-inch mill. Tensile stress-strain data of Table 2 were obtained from sheets cured and tested according to A.S.T.M. specifications. Aging of both sheets and pellets was carried out in a constant temperature circulating air oven at 100° C. for 48 hours.

Technique employed in making the vibration fatigue measurements was essentially that of Lessig's[3] (or that later described as A.S.T.M. Designation D623-41T, Method A). Conditions were as follows: stress, 175 pounds per square inch, amplitude 0.175- and 0.200-inch respectively, frequency 30 cycles per second.

TABLE 4. VIBRATION DATA — STOCK 2

	30-Minute Cure				90-Minute Cure			
	Amplitude				Amplitude			
	0.175-Inch		0.200-Inch		0.175-Inch		0.200-Inch	
	Unaged	Aged	Unaged	Aged	Unaged	Aged	Unaged	Aged
Initial static comp.*	52.5	40.0	51.2	37.5	47.9	41.7	42.5	41.4
Initial dynamic comp.*	46.8	33.2	42.4	29.1	39.2	35.3	35.1	33.3
Final dynamic comp.*	—	42.6	71.0	75.7	49.2	48.4	47.7	—
Final static comp.*	72.5	39.4	56.0	60.8	62.1	58.6	61.3	60.0
H during Flexure†	+20.0	—0.6	+4.8	+23.3	+14.2	+16.9	+18.8	+18.6
Vibration Time — Hours					42‡	90‡	77‡	72‡
0.083	61‡	78‡	85‡	64‡	84	103	80	81
0.166	61	102	103	77	94	105	83	83
0.250	61	110	109	83	96	107	84	84
0.333	61	112	114	87	100	110	86	85
0.416	64	112	116	90	102	112	87	86
0.500	64	112	117	92	103	113	88	87
0.583	65	112	122	94	104	115	88	88
0.667	66	112	124	78	104	116	89	88
0.750	66	112	130	76	105	117	90	88
0.833	120	112	132¶	77	107	119	91	90
1.0	146	112		77	116	128	92	95
2.0	200	111		80	123	134	98	99
3.0		113		82	128	137	104	104
4.0		114		84**	132	138	107	106
5.0		118			134	140	110	110‖‖
6.0		118			136	140	112	
7.0		120‖			136	140‡‡	114	
8.0					138		119	
10.0					138††		122	
12.0							121	
14.0							122	
16.0							122	
18.0							123§§	
20.0								

*% compression.
†% change in height.
‡Temperature in °C.
§Specimen burst at two hours.
‖Abrupt rise in temperature at 7.25 hours caused by large rupture at center of specimen. Vibration very great.
¶Rupture at 0.75-hour.
**Rupture at four hours, but specimen ran for 0.5-hour longer. Vibration started shortly after rupture and became uncontrollable after 0.5-hour.
††Vibration at 12 hours made further running impossible. No internal failure.
‡‡Rupture at 8.75 hours. Vibrating badly at that time. Temperature rise to equilibrium rather quickly.
§§Temperature rise was rather fast. After 70 hours, vibration became so severe as to necessitate removal of specimen. No internal failure observed.
‖‖Rather severe vibration started at six hours and continued for about 0.25-hour until removal of specimen. No internal failure observed.

Natural Rubbers

(*Continued from page 61*)

positions as those of the *Funtumia*.

GRADES OF WILD RUBBER: Grades of wild rubber available from the Office of Rubber Reserve, Reconstruction Finance Corp., the central and only source of rubber during the war years and through March 31, 1947 follow:

WILD RUBBER GRADES — OFFICE OF RUBBER RESERVE

Uncut Fines	—	Crude
Cut Fines	—	Crude
Cut Fines	—	Washed & Dried
Islands Fine	—	Crude
Islands Fine	—	Washed & Dried
Weak Fine	—	Crude
Weak Fine	—	Washed & Dried
Cameta	—	Crude
Cameta	—	Washed & Dried
Upriver Coarse	—	Crude
Upriver Coarse	—	Washed & Dried
Manicoba	—	Crude
Manicoba	—	Washed & Dried
Manicoba Choro (*Ceara* Scrap)	—	Crude
Manicoba Choro (*Ceara* Scrap)	—	Washed & Dried
Central Scraps	—	Crude
Central Scraps	—	Washed & Dried
Caucho Ball	—	Crude
Caucho Ball	—	Washed & Dried
Panama Slab	—	Crude
Panama Slab	—	Washed & Dried
Mangabiera	—	Crude
Mangabiera	—	Washed & Dried
Cameroons	—	Crude
Guayule	—	Crude
Guayule	—	Washed & Dried

There was a considerable increase in the production of balata in 1946 in Surinam. During the first eleven months of the year, the total collected was 255,616 kilograms, against 183,779 kilograms in the same period of 1945.

Recent Russian Literature

(*Continued from page 62*)

Polychlorovinyl by itself is not elastic and can only be made so by blending it with suitable plasticizers. Another important agent in compounding polychlorovinyl is a stabilizer whose function is to prevent splitting off of HCl. The present work deals with the method of polymerization of vinyl chloride and the effect of various plasticizers. Of the two polymerization methods, in alcohol and in emulsion, the latter gives a product of better physical properties. Generally, the longer the polymerization, the stronger is the product.

Two methods of incorporating the plasticizer were tested. In one of these the plasticizer was added to the mixture to be polymerized, and in the other the plasticizer was admixed to the polymerization product. The second, i.e., admixing the plasticizer to the polymer is preferable since it gives a product of better mechanical properties than when the plasticizer is mixed with the monomer. The following plasticizers were tested: tricresyl phosphate, coumarone resin, tricresyl phosphate plus coumarone resin, diethyl phthalate, chlorinated diphenyl, and others. Polychlorovinyl plasticized with any one of these plasticizers was dissolved in dichloroethane to a 10% solution. These solutions were poured on glass to make 0.2-0.3-millimeter films, and the films were tested for hardness and adhesion. Best hardness and adhesion had the films plasticized with tricresyl phosphate and coumarone resin, which had been taken separately.

EDITORIALS

Rubber Goods Industry Fortunate

THE continuing high level of prices, even with a level of industrial production in the United States that is 75% above that of 1940, coupled with a second series of postwar demands by organized labor for wage increases, is causing increasing concern with regard to "when and how much" of a business recession may be experienced in this country. The opinion of most business analysts seems to be that an adjustment of the price structure to a lower level with a corresponding lowering of the level of industrial production may take place during the third quarter of 1947. The extent of these changes will differ from industry to industry, and the average is not expected to be greater than about 25%.

It would be illogical to argue that the historical pattern of the rise and fall of prices, production, national income, and consumer demand woud not repeat itself after the late war as it has after previous wars. However, now that the rise part of the curve for prices, production, and income appears to be encountering resistance by virtue of a lessening of consumer demand, the various industries of the country are, or should be, reexamining their plans and prospects for the future in order that they may adjust their operations where necessary. By so doing, they obviously hope to be among those that will experience the least reduction in the demand for their products and therefore will be able to maintain production and income as near their present levels as possible.

In this respect the rubber goods manufacturing industry is most fortunate and should be able to establish a new record for stability of peacetime operations to add to its outstanding record of achievement during the reconversion period. In the production of tires this branch of the industry should be able to match its record output of 1946. Although the demand for replacement tires may decrease in the second half of this year, the demand for tires as original equipment is increasing as the automobile manufacturers finally reach their prewar production rate. In contrast to the considerable rise in the price of the products of many major industries in the last several months, the price of tires has not been raised, and no increase is planned for standard grades. Even though competition forces lower tire prices and a lower profit margin for this branch of the industry, the mechanical goods, footwear, general sundries, and particularly the latex products lines of most companies have not reached the manufacturing rate warranted by still unsatisfied poswar demand for these types of goods and should provide the additional necessary source of profit. In addition, many rubber fabricating companies have developed products in the chemical and plastics fields where the long-term demand outlook is good.

Of course, no matter how great the demand for the products of an industry are, or how well equipped the industry may be to manufacture goods to satisfy the demand, unless raw materials and labor are also available in ample supply and at a stable and reasonable cost, the operations of the industry are generally not profitable and are therefore unable to contribute to the continued prosperity of the country as a whole. Here again, the rubber goods industry is fortunate in that its major raw material, rubber, is now and should be for some time to come in ample supply. The availability of natural rubber has grown steadily since the end of the war and, in spite of some opinions to the contrary, should increase at an even greater rate and without any overall major rise in price, with the end of exclusive government purchasing on April 1, 1947. The passage of the Crawford Bill by Congress also insures the maintenance of our synthetic rubber industry and the availability of adequate supplies of American rubber. Other component materials necessary for the manufacture of tires and nontire products are expected to be in better supply as the year moves along.

It is in the field of labor supply and cost that the rubber goods industry has recently forged ahead of many other industries. The agreement between the Big Four companies and the URWA of March 23, for a reasonable wage increase of 11½¢ an hour, has set a pattern for all mass production industries in the United States that should do much to maintain the economic stability of the country during the next year. This pattern, which will probably be followed by most of the other companies of the industry, and the pattern for working conditions also recently established by the United States Rubber Co. and the Goodyear Tire & Rubber Co., should mean that management can now plan its program for at least a year ahead with good assurance of freedom from wide variations in labor cost and supply.

With such a fortunate set of circumstances and with such an encouraging outlook for the immediate as well as the more distant future, it is hoped that the rubber goods industry will be able not only to avoid any reduction in its production rate in 1947, but will by the stability of its operations contribute much to the general welfare of the country. This contribution can be accomplished by both management and labor if the former adheres closely to recently expressed intentions not to raise the price of its products and to lower them as soon as further increases in production are achieved, and if the latter does everything possible to increase the productivity of the workers and eliminate irresponsible and unnecessary work stoppages.

The achievements and growth of the rubber industry since 1941 have resulted in the elevation of the industry and its members to a position of much greater recognition and prominence in national affairs. In return, the industry should assume a greater degree of responsibility for the conduct of national affairs, both where rubber and rubber products are concerned and where the overall economic conditions of the country itself are concerned.

Scientific and Technical Activities

A.C.S. High Polymer Forum at Atlantic City

ALTHOUGH the Division of Rubber Chemistry of the American Chemical Society will not have a regular program at the spring meeting of the parent society to be held in Atlantic City, N. J., April 14 to 18, the Division is sponsoring the High Polymer Forum for this meeting. Collaborating with the Division of Rubber Chemistry in this effort are the divisions of Cellulose; Colloid, Organic; Paint, Varnish and Plastics; and Physical and Inorganic Chemistry. H. I. Cramer, of Sharples Chemicals, Inc., and former secretary of the Division of Rubber Chemistry, is chairman of the forum.

The program for this forum is scheduled to begin on Monday afternoon, April 14, and continue through Tuesday, April 15, with both a morning and afternoon session on that day. The Monday afternoon papers are specially grouped as a "Symposium on Thermodynamics of Polymer Solutions." The papers presented on Tuesday are classified as "General." The program and abstracts of the papers follow:

PROGRAM OF HIGH POLYMER FORUM

APRIL 14—AFTERNOON SESSION
P. Debye, Presiding

Introductory Remarks. H. I. Cramer and P. Debye.

Phase Equilibria in the System: I. Polymer - Solvent - Precipitant. Previous treatments of equilibria in three component systems of polymer and two liquids usually involve transformation to an equivalent binary mixture of polymer with a hypothetical single liquid of average properties. Provided the heat of mixing has a simple form analogous to the common two component equations of Hildebrand, Scatchard, and van Laar, this "single liquid" treatment can always be used for one-phase systems. Its use for two-phase systems requires the unlikely assumption that the proportion of solvent to precipitant is the same in both phases. Phase diagrams have been calculated for a number of systems, using the usual free energy equations of Flory and Huggins. Comparison with the "single liquid" treatment shows that this approximation is useless except for crude qualitative considerations. The position of the phase boundary is nearly independent of molecular weight of the polymer for molecular weights much above 10,000. A polymer is completely soluble in a certain mixture of two non-solvents if its internal pressure lies between those of the two liquids, and the two liquids are themselves completely miscible. Analytical expressions for the plait points of such ternary systems are derived.

II. Polymer - Polymer - Solvent. The same thermodynamic analysis used in the previous treatment of the system polymer-solvent-precipitant is applied to a ternary system of two polymers and one solvent. In the absence of a solvent two different polymers are always immiscible with each other unless the heat of mixing is virtually zero or negative. In the three-component system, the two-phase region may persist at very low concentrations of polymer. In most cases the primary role of the solvent is that of dilution, reducing the heat of mixing of the two polymers. The exact nature of the solvent is of only secondary importance, provided that it is a "good" solvent for both polymers. This agrees with the experimental results of Mmes. Dobry and Boyer-Kawenoki[1] who report incompatibility of different polymers in a good solvent at concentrations of polymer as low as 1%. R. L. Scott, Frank B. Jewett Fellow, University of California, Berkeley, Calif.

Phase Equilibria in Solutions of Mixed Polymers. The tendency toward incompatibility of two different polymers persists in dilute solutions, often causing separation into two phases at concentrations of the order of 1%. We have used the Flory-Huggins theory of polymer solutions to explore certain features of this behavior.

Analytical treatment is feasible for a very special case: two mono-disperse polymers with equal molecular weights and equal interactions (μ-values) with the solvent. Here the critical phase has a polymer concentration inversely proportional to the molecular weight and to the μ-value describing the polymer polmer interaction. As the concentration is increased, segregation of the two polymers into separate phases is very rapid, being within 1% of completion at little more than twice the critical concentration.

The effect of polydispersity was investigated for this special case: the critical composition depends on the *weight average* size; however, the presence of small molecules, as expected, reduces the tendency for segregation considerably.

Numerical calculations for several less specialized systems (i. e., unequal molecular weights and interaction constants) were also made. The results support the suggestion that analysis of the phases at equilibrium affords an easy and useful relative method of measuring molecular weights or interaction constants. Our calculations indicate the limitations and errors involved. W. H. Stockmayer and H. E. Stanley, Massachusetts Institute of Technology, Cambridge, Mass.

The Sedimentation and Diffusion Constants of Polymers.[2] Expressions for the sedimentation and diffusion constants of coiling polymers have been developed by a method similar to that used for the calculation of intrinsic viscosity.[3] The method takes into account the effects on the liquid flow around a group in the molecule of the disturbances caused by all the other groups.

It is shown that these constants are not measures of molecular weight alone, but depend primarily upon the extent of coiling of the molecule and the friction coefficients for the groups in the molecule. Stokes' form of the molecular friction coefficient is found to be a limiting case for very compactly coiled polymers.

The usual exponential representation of the dependence of these constants on molecular weight is shown to be a good approximation for limited molecular weight ranges. Actually the exponent depends on the type of molecule and is a function of the molecular weight. Convenient expressions can be written so that existing data expressed in this way may be translated into values for an average radius of the space occupied by the molecules and for a so-called shielding ratio expressing the amount of screening of the interior parts of the molecule from the flow of the solvent along the outside.

The discussion can be extended to include branched and cross-linked polymers. Here the exponent again depends on the molecular weight, but the limiting values for small and large molecular weights are different. It will probably be possible from measurements of viscosity and diffusion or sedimentation in combination with measurements of the size derived from the dissymmetry of light scattering to estimate the amount of cross-linking or branching. P. Debye and A. M. Bueche, Cornell University, Ithaca, N. Y.

Intrinsic Viscosity-Molecular Weight Relationships for GR-S and Polystyrene. A very careful fractionation of GR-S has been carried out. This was followed by the determination of the intrinsic viscosities and the osmotic molecular weights of the fractions. These results are in substantial agreement with earlier measurements by French and Ewart.

A similar investigation was made of polystyrene fractions. The polystyrene was also prepared by emulsion polymerization. In this case both benzene and butanone were used for viscosity measurements. A smaller exponent was found in the general relationship:

$$[\eta]=KM^a$$

for the poorer solvent, butanone. This is in agreement with the recent theory of polymer solution viscosity by P. Debye.

An equation is given expressing the intrinsic viscosity of unfractionated polystyrene in terms of its number average molecular weight. These results were obtained on polystyrene samples having a wide range of average molecular weights, but prepared in such a way as to have the same simple distribution of molecular weights. Hence this last equation should only be used on similar samples of unfractionated material.

The intrinsic viscosities, $[\eta]$, at 30° C. of these systems as a function of molecular weight are given by the following:

POLYMER	SOLVENT FOR VISCOSITY	RELATIONSHIP
GR-S fractions	Benzene	$[\eta] = (4.91 \times 10^{-4})\ M^{0.67}$
Polystyrene fractions	Benzene	$[\eta] = (0.97 \times 10^{-4})\ M^{0.74}$
	Butanone	$[\eta] = (3.06 \times 10^{-4})\ M^{0.60}$
Unfractionated polystyrene	Benzene	$[\eta] = (0.75 \times 10^{-4})\ M_n^{0.783}$

R. H. Ewart and H. C. Tingey, United States Rubber Co., Passaic, N. J.

Compositional Heterogeneity of Copolymers and Its Effect on Viscosity and Fractionation Studies. The GR-S system is used to illustrate a unique method of determining the effect of compositional changes in a copolymer chain on the viscosity and solubility of the copolymer. It is generally known that in most copolymerizations the comonomer ratio in the polymer chain will change continuously during the reaction. This phenomenon has been observed in the GR-S system.

[1] *J. Polymer Science*, Dec. 1946.
[2] This investigation was carried out under the sponsorship of the Reconstruction Finance Corp.
[3] P. Debye, *J. Chem. Phys.*, 14, 636 (1946); *Bulletin A.P.S.*, 22, 33 (1947); Reports to Office of Rubber Reserve.

Such changes may, to a greater or lesser extent, obscure desired information concerning molecular size, as obtained by viscosity or fractionation studies.

In this work a technique was devised whereby relatively homogeneous polymers were prepared, having the same molecular weight or degree of polymerization, but with variable butadiene-styrene contents. This technique eliminates the variable of chain-length and permits a demonstration of the effect of polymer composition.

For a given degree of polymerization the effect of increased styrene content in the chain is to increase the solubility of the polymer in a given benzene-methanol mixture. Thus in the system under study the peak in the precipitation distribution curve shifted from 18 volume per cent. methanol for polybutadiene to 25 volume per cent. methanol for polystyrene. The significance of this solubility change can be appreciated when it is considered that standard GR-S polymer is almost completely precipitated in the range of 17 to 27 volume per cent. methanol.

For a given degree of polymerization an increase in styrene content generally leads to a decrease in the intrinsic viscosity of the polymer. This result is to be expected from a consideration of the effect of styrene content upon chain length. In the case of polystyrene, however, an anomalous slight increase in viscosity was observed. Although no reliable explanation can be presented, it is considered probable that this increase may be due to the absence of branched chains in the linear polystyrene molecules. D. B. MacLean, M. Morton, and R. V. V. Nicholls, McGill University, Montreal, P. Q., Canada.

APRIL 15—MORNING SESSION
Maurice L. Huggins, Presiding

Viscosity-Molecular Weight and Viscosity-Temperature Relationships for Polystyrene and Polyisobutylene.[1] Melt viscosities of fractionated samples of polystyrene and polyisobutylene ranging from about 5,000 to more than 100,000 molecular weight have been measured at various temperatures. The logarithm of the melt viscosity at constant temperature is a linear function of the square root of the molecular weight in each case, except at low molecular weights.

Plots of log viscosity *vs.* the reciprocal of the absolute temperature are non-linear; the slopes increase with decreasing temperature. The apparent activation energies for viscous flow computed from the slopes, d (log η)/d(1/T), of these plots increase with decreasing temperature: for polystyrene from 22 kcal. at 217° C. to 37 kcal. at 176° C., and for polyisobutylene from 10.5 kcal. at 217° C. to 13.0 kcal. at 125° C. Viscosity-temperature coefficients are independent of molecular weight for polyisobutylene, i. e., log η *vs.* 1/T curves for various samples are parallel within experimental error. In the case of polystyrene, however, such curves are accurately parallel only for molecular weights above about 20,000; viscosity-temperature coefficients decrease with molecular weight below this limit. T. G. Fox, Jr., and P. J. Flory, Goodyear Tire & Rubber Co., Akron, O.

X-Ray Diffraction Studies of Some Synthetic Rubbers at Low Temperatures. A low temperature technique is described for obtaining X-ray diffraction diagrams of stretched raw polymers. Relaxation of the specimen is prevented during the X-ray exposure by maintaining the sample at a temperature of —70° C. In many cases polymers which failed to show fibering, when stretched at room temperature, did show fibering when stretched at a lower temperature.

Emulsion polybutadiene gives a fiber pattern with two reflections on the meridian. Interpretation of these orders as 2 and 4 gave an identity period of 4.53 Angstrom units corresponding to the trans structure. Equatorial arcs were observed at 4.12, 3.47 and 2.20 A.

Sodium polybutadiene showed only a single pair of equatorial arcs at 5.75 A. The absence of a meridian pattern is indicative of the lack of regularity along the chain.

Sodium and emulsion polymerized polyisoprene gave only equatorial arcs at 6.46 and 4.85 A, respectively. In both the polybutadienes and the polyisoprenes the side spacings given by the equatorial arcs were consistent with the percentages of 1,4 addition as determined by the perbenzoic acid oxidation method.

Emulsion polydimethylbutadiene showed a set of three spacings on the meridian and of one on the equator. An interpretation of the diagram is being made. E. E. Hanson and G. Halverson, Firestone Tire & Rubber Co., Akron.

Thermodynamics of Crystallization in High Polymers.[1] I. Crystallization Induced by Stretching. A theory of oriented crystallization in elongated polymers having network structures (e. g., in vulcanized rubber) has been developed through the application of statistical mechanical procedures similar to those employed in rubber elasticity theory. Expressions have been derived which, within the limitation imposed by the simplifying assumptions, relate the incipient crystallization temperature with the elongation, the degree of crystallinity with the elongation and temperature, and the retractive force at crystallization equilibrium with the elongation at constant temperature. The reciprocal of the absolute temperature for incipient crystallization is predicted to decrease linearly with a simple function of the elongation and the average number of chain segments between cross-linkages. Only moderate degrees of crystallinity are predicted at equilibrium. In conformity with requirements of the second law of thermodynamics, equilibrium crystallization decreases the tension in the stretched specimen according to the present theory.

Apparent discrepancies between some of these predictions and various observations arise owing to severe departure from equilibrium crystallization when the polymer undergoes crystallization *during* the stretching process. A better approach to equilibrium should be achieved by stretching under conditions which prevent crystallization (e.g., at elevated temperature), then allowing crystallization to proceed at fixed elongation. Few experiments have been performed in this manner, but such results as are available confirm qualitatively the predictions of the theory.

Reasons for the rapid increase in tension observed when crystallization occurs during ordinary stretching of rubber will be discussed. Crystalline and amorphous regions preferably should not be regarded as separate phases. Likewise, the conversion of amorphous to crystalline polymer does not conform to the definition of a phase transition. P. J. Flory.

An Investigation of the Structure of Polymers by Birefringence Studies. The stress of a polymer held at a definite extension is related to both the internal energy and entropy of the polymer configuration. The birefringence of a solid polymer, on the other hand, is a configurational property—dependent only upon the disposition of molecules in the solid state and independent of the forces between them.

Polymers are classified into *ideal* rubbers where the stress is entropy determined and $\left(\frac{\partial E}{\partial l}\right)_T = 0$ for constant volume distortions; *regular* rubbers where the stress is determined by both entropy and energy, but the molecular configuration (entropy) is not affected by the energy interactions; and *non-ideal* polymers where both energy and entropy affect stress and each other. For ideal rubbery polymers, the ratio of stress to birefringence varies linearly with temperature and is expected to be independent of time for relaxations involving a single molecular process. For regular rubbers, greater temperature dependencies are to be expected, and the ratio of stress to birefringence varies with time, approaching a constant value with time. The deviations may be directly interpreted as variations of internal energy with configurational changes. For non-ideal polymers, similar deviations are found, but must be ascribed to both energy and entropy.

By measurements of strain and birefringence as a function of strain, temperature, time, and molecular structure, one may explore aspects of the symbolic equation:

Entropy + Internal Energy ⇌ Free Energy

Distribution Function Stress

Birefringence

An apparatus for the simultaneous measurement of stress and birefringence as a function of strain, temperature, and time is described.

Experimental examples of several ideal rubbers are presented (polysulfide rubbers, *Hevea* gum vulcanizate, and cast sheets of *Hevea* latex). It is shown that ideal stress-birefringence behavior is observed irrespective of the detailed relaxation mechanism (chemical or physical). A non-ideal case is illustrated, and the application of the method to the study of internal transitions separating regions of stress behavior governed by entropy and energy is demonstrated. R. S. Stein and A. V. Tobolsky, Textile Foundation and Plastics Program, Princeton University, Princeton, N. J.

Effects of Cross-Linking and Branching on the Molecular Constitution of Diene Polymers. Diene polymerizations usually are complicated by cross-linking reactions. These are believed to originate from occasional addition of the free radical terminus of a growing chain to an unsaturated carbon atom of a diene unit belonging to a previously formed polymer molecule. A kinetic treatment of this process indicates the manner in which the concentration of cross-linkages in the polymer increases with conversion. The rate of free radical addition to a previously polymerized unit relative to its rate of addition to monomer can be deduced from the average chain length and the conversion at which gel first appears.

Cross linkages introduced by the mechanism under consideration are not distributed at random, but the deviations from a random distribution are unimportant except at high conversions. Under certain conditions the cross-linking reaction may decrease the total number of molecules more rapidly than they are formed.

Physical properties of polymers (with particular emphasis on vulcanized rubbers)

[1] Project sponsored by the Office of Naval Research.

are most conveniently interpreted in terms of (1) the primary molecular weight (i. e., molecular weight in the absence of cross-linkages) and its distribution, and (2) the concentration of cross-linkages. The actual molecular weight distribution, which may be severely distorted by the presence of cross-linkages, is inappropriate for direct correlation with the more important physical properties. The modifiers commonly employed in diene polymerization offset the effects of (2) at a sacrifice in (1).

Branching may result from chain transfer with a previously formed polymer molecule. Such processes, which are incapable of leading to network formation, should be clearly differentiated from cross-linking reactions. P. J. Flory.

Chemo-Rheology of Polysulfide Rubbers. The cold flow in polysulfide rubbers is shown to be due to chemical exchange reactions between bonds in adjacent polymer chains. The exchange between terminal mercaptans and disulfide or polysulfide linkages is particularly rapid. The rate of stress relaxation is accelerated several hundred-fold by incorporation of a few tenths of 1% of mercaptan to the rubbers. Addition of elemental sulfur or exposure to ultra-violet light also accelerates the rate of stress relaxation. Certain chemical agents which may either act as mercaptan or possibly free radical terminators are shown to decrease the rate of cold flow. M. Mochulsky and A. V. Tobolsky, Princeton.

April 15—Afternoon Session
H. I. Cramer, Presiding

Copolymerization Equilibrium. It is suggested that at sufficiently high temperatures, equilibrium polymerization-depolymerization will govern copolymer structure and composition as well as molecular weight distribution. It should therefore be possible to produce "equilibrium copolymers" by heating together at sufficiently high temperatures: (a) a mixture of the two monomers, (b) a mechanical mixture of the two polymers, (c) a mixture of one monomer and another polymer, (d) a copolymer of the two monomers. It of course must be realized that except for certain favorable polymers, side reactions such as chain transfer and splitting off of products such as HCl will complicate the simple picture described above. Furthermore fairly low molecular weight materials are to be expected at these elevated temperatures.

For the simple case where only linear polymerization and depolymerization are involved, statistical-thermodynamic treatments were carried out which give the "equilibrium copolymer" structure in terms of the bond energies and entropies.

Experimental evidence for the formation of copolymers by these methods has been obtained, but probably complete equilibrium was not achieved. T. Alfrey, Jr., Polytechnic Institute of Brooklyn, Brooklyn, N. Y., and F. Leonard and A. V. Tobolsky, Princeton.

Polyamide Resigns from Dillinoleic Acid and Ethylene Diamine. Molecular Weight-Viscosity Relationships. Polyamides have been prepared from purified dilinoleic acid and ethylene diamine, with molecular weights from 2,200 to 12,000. Certain properties are reported. Solution viscosities were determined in 1-1 n-butanol-toluene at concentrations from 0.2 to 9.8 grams per 100 cubic centimeters. Up to at least 1.5%, $\ln\eta_r$ is directly proportional to concentration. Intrinsic viscosities were determined from the slope of the $\ln\eta_r$ vs. c lines. From 2,000 to at least 10,000, the relation of $[\eta]$ to molecular weight is expressed by

$$[\eta] = 0.0755 + 1.25 \times 10^{-5} M$$

which is similar to the relation found by Flory for polyester solutions. The existence of this relation means that the ratio of weight average (M_w) to number average (M_n) molecular weight is constant in the polymers as prepared. The molecular weight of a mixture of polymers determined from the η agrees well with the calculated M_w of the mixture, but not with the M_n of the mixture. This fact also indicates a constant ratio of the M_w to M_n in the polymers as prepared. D. H. Wheeler, General Mills, Inc., and R. Anderson, University of Minnesota, both of Minneapolis, Minn.

Effect of Emulsifiers and pH in the Emulsion Polymerization of Styrene. Series of emulsion polymerizations of styrene were carried out in sealed glass ampoules rotated four hours at 60° C. in a water thermostat. Five-gram samples of styrene were used in standardized compositions including 0.7% hydrogen peroxide (styrene basis) and 7.5 grams water. The series included 19 emulsifiers, four concentrations of each emulsifier, and five pH levels. The emulsifiers investigated were Aerosol AY, Aerosol IB, Aerosol MA, Aerosol OT, Aerosol OS, cetyl dimethylamine, Duponol ME dry, nonaethylene glycol monolaurate, nonaethylene glycol monooleate, Nopco 2149-A, sodium carboxymethyl cellulose, sodium oleate, sodium stearate, Span 20, Span 80, Triton K-60, Triton NE, Tween 20, and Tween 80. The emulsifier concentrations were 0.25, 0.5, 1.0, 2.0, and 5.0% (styrene basis)—the first four concentrations were used for Aerosal OT; the last four concentrations were used for all the other emulsifiers. The pH was adjusted by adding either NaOH or HCl. Two or three emulsifiers (40 or 60 experiments) were conducted at the same time to effect optimum uniformity.

Plotted polymer yield data show the superiority of cetyl dimethylamine over all of the other emulsifiers examined. Sulfated and sulfonated emulsifiers were next in order of effectiveness. Sodium oleate proved very active and much more active than sodium stearate. The specific importance of pH indicates that it must be thoroughly investigated before deciding the superiority of one emulsifier over another. Cetyl dimethylamine and the sulfates and sulfonates prove most active when slightly acidified; whereas the soaps become most active when slightly basified. Yields are directly proportional to emulsifier concentration. G. E. Moos and E. P. Irany, Celanese Corp. of America, Newark, N. J.

Certain Ingredients of Soaps as Retarders of the Copolymerization of Butadiene and Styrene. Linoleic and linolenic acids are retarders of the rate of copolymerization of butadiene and styrene in the GR-S recipe. The replacement of up to 10% of sodium palmitate emulsifier by sodium linoleate resulted in a reduction of the conversion obtained in 12 hours of 1.4% for each per cent. of sodium palmitate replaced. Linolenic acid exerts approximately three times as great a retarding action as linoleic acid. No evidence was found for the presence in prime tallow, No. 1 tallow, or yellow grease of substances inhibiting or retarding the emulsion copolymerization of butadiene and styrene (GR-S recipe) other than linoleic, or, if present, linolenic acid. 1,4-Pentadiene, which contains the same double-bond structure as is present in linoleic acid gave a retarding effect of the same magnitude as linoleic acid. Linoleic acid, isomerized to the conjugated acid, did not retard. Highly purified oleic, elaidic, stearic, and palmitic acids, when employed as emulsifying agents for the copolymerization of butadiene and styrene, gave essentially identical hydrocarbon conversions in 12 hours. Hydrogenated soybean oil soap (iodine value of 40 to 50) employed as the emulsifier resulted in a rate of polymerization equal to that obtained with highly purified fatty acid soaps. J. W. Wilson, Union Oil Co., Oleum, Calif., and E. S. Pfau, B. F. Goodrich Co., Akron.

The Effect of Meta and Para Substituents on the Reactivity of the Styrene Double Bond in Copolymerization. Earlier work has established that there is no simple order of activity of double bonds in copolymerization, but rather that reactivity depends upon the nature of the attacking radical as well. In an attempt to separate the factors involved, the reactivity of substituted styrenes has been investigated by copolymerization with two representative monomers, styrene and methyl methacrylate, with the results listed:

Relative Reactivity With Indicated Radical Type

Substituent	Styrene	Methacrylate
p-OCH_3	.86	1.72
p-$N(CH_3)_2$	.98	2.44
p-CH_3	—	1.23
m-CH_3	—	.94
None	1.00	1.00
p-C	1.35	1.27
p-Br	1.44	1.27
p-I	1.61	1.39
m-C	1.56	1.06
m-Br	1.82	1.04
p-CN	3.57	2.27
p-NO_2	5.26	—

In reactions with the styrene radical, effects of substituents lie in the same order found for polar reactions[4] with a rho value of .509. This is considered to indicate that in this reaction *m*- and *p*- substituents act by altering the electrostatic interaction between the approaching radical and the styrene double bond, and that the styrene-type radical behaves as though it possessed a partial negative charge. Similar conclusions are indicated for the reaction of the methacrylate-type radical with most of the substituted styrenes. However, *p*-CH_3—, *p*-OCH_3—, and *p*-N-$(CH_3)_2$— styrenes show unexpectedly high reactivities. This reactivity is correlated with their high tendency to form molecular complexes with conjugated carbonyl systems (maleic anhydride, chloranil, etc.) and the resemblance between the postulated structures of these complexes[5] and certain resonance forms available in the activated complex of the polymerization is pointed out. C. Walling, E. R. Briggs, K. B. Wolfstirn, and F. R. Mayo, U. S. Rubber, Passaic.

Vulcanization of Rubber. I. Stoichiemetry of the Cross-linking Reaction. It his been discovered that when the conditions of vulcanization are controlled so as to give the maximum yield of sulfur intermolecular cross-linkages, the vulcanizate produced has the unique characteristic of having one chemical cross-link per molecule of zinc sulfide formed. This fact has been demonstrated by application of the equations of Wall[6] and Flory[7] to equilibrium stress and sulfide sulfur data obtained on this vulcanizate. The important variables for contributing to the efficient utilization of sulfur in forming cross-links between rubber molecules will be discussed.

Farmer and Shipley[8] reported that no

[4] L. P. Hammett, "Physical Organic Chemistry," Chap. VII, pp. 184-228. McGraw-Hill Book Co., Inc., New York (1940).
[5] Weiss, *J. Chem. Soc.*, 245 (1942).
[6] *J. Chem. Phys.*, 10, 132, 485 (1942).
[7] *Chem. Rev.*, 35, 51, 1944).
[8] *J. Pol. Sci.*, 1, 293 (1946).

product containing new carbon-carbon bonds were formed in the reaction of dihydromyrcene with sulfur. This latter fact is particularly significant since it indicates that all the cross-links in rubber vulcanized with sulfur may be considered as containing the sulfur atom. If this is the case, the number of cross-links is too great to permit the assumption of any cross-linkage other than the monosulfide. By assuming that monosulfides are the only cross-links present in this new vulcanizate, it is possible to distribute the sulfur that has reacted as cross linked sulfur (S_{cr}), chain sulfur (S_{ch}), and zinc sulfide (S-). The implications of this division of the types of sulfur will be detailed.

The results of this investigation will be interpreted in terms of a simplified mechanism involving an unstable rubber-sulfur intermediate. Further reaction of this intermediate takes place through two simultaneous reactions: one leading to intermolecular monosulfides, the other to intramolecular sulfur derivatives. The intermolecular monosulfide reaction involves soluble zinc compounds, and its relative proportion increases with increasing soluble zinc compound concentration. B. C. Barton and E. J. Hart, U. S. Rubber, Passaic.

The Rate of Exchange of Cellulose with D_2O. If dry cellulose is placed into heavy water, its hydroxyl groups exchange hydrogen for deuterium. A study was made of the rate of this exchange for various cellulose samples. In all cases essentially the same exchange curve was obtained; a fast reaction takes place first, which is essentially completed in less than one hour. It is followed by a much slower process which continues for days. For the samples studied, the fast exchange corresponded to the reaction of 40 to 75% of the hydroxyl groups present in the material. The subsequent slow reaction in about one week exchanged only a small additional percentage of hydroxyl groups. Complete reaction of all the hydroxyls was never obtained with any of the samples under the conditions of our experiments.

The results seem to indicate that the hydroxyl groups in a cellulose fiber may be divided essentially into those which are readily exchanged and those which are essentially not exchanged at all. The former are apparently very easily accessible; their existence has been already indicated by other experimental methods. Adopting the idea of the existence of highly ordered (crystalline) and essentially disordered (amorphous) domains in cellulose, it seems conceivable that the OH- groups, which exchange rapidly, are located at the surface of the crystalline areas and through out the amorphous portions. These two contributions amount to 40-75% of all hydroxyl groups, depending upon the sample under consideration. The residual OH-groups are apparently located inside the crystalline domains and so strongly interlocked with each other by hydrogen bonds that they exchange H for D only very slowly. V. J. Frilette and H. Mark, Polytechnic Institute of Brooklyn.

Akron Group to Meet May 9

THE Akron Rubber Group will hold its spring meeting on May 9, when announcement of results of the election of officers for the coming year will be made. Guest speaker will be Frank H. Carman, general manager of the Plastic Materials Manufacturers Association, who will talk on plastics.

Neoprene Latex and Pliolites Discussed at Boston

ATTENDANCE at the March 14 meeting of the Boston Rubber Group, held at the Hotel Somerset, Boston, Mass., was a record for technical meetings of this Group; 415 members and guests were present. C. E. Reynolds, Cambridge Rubber Co., chairman, presided and introduced the speakers: R. H. Walsh, of E. I. du Pont de Nemours & Co., Inc., and H. R. Thies, of the Goodyear Tire & Rubber Co. The subject of Mr. Walsh's talk was "Neoprene Latex Applications"; while Mr. Thies spoke on "Pliolite Copolymer Resins and Their Uses."

Mr. Walsh first pointed out that although at the beginning of the late war most manufacturers turned to neoprene latices as a good substitute for natural rubber latices, the increased use of the neoprene latices throughout the war years brought a greater appreciation of the unusual properties of neoprene latex films, their resistance to sunlight, ozone, heat aging, solvents, and flame, and showed conclusively that neoprene latices should now be thought of as new and unusual basic latices upon which an ever-expanding field of uses could be built. He then discussed in turn applications of these latices in dipped goods, latex thread, balloons, latex foam, as coating for hair, fiber and staple fillers for upholstery, as adhesives, and for paper and fiber impregnation and rug and fabric backing.

Neoprene latex gloves are being used to an increasing extent in the synthetic fiber and petroleum industries because of their superior oil and solvent resistance; while household gloves find a ready market by virtue of their quality and performance features. Neoprene surgeons' gloves that will withstand 125 sterilizations without loss of tensile strength, as compared with surgeons' gloves from natural latex that withstand only 25 sterilizations, are also meeting with greater acceptance. Neoprene latex thread, in contrast to natural rubber thread, has an extremely flat curing curve, and normal variations in curing time and temperature will not change its elongation and modulus properties. Thus neoprene latex thread can be woven into garments with much less danger of puckering than when natural rubber thread is used.

Not only does neoprene latex foam match all the properties of natural rubber foam, but it offers other outstanding properties, including flame resistance, sunlight and ozone resistance, superior flex resistance, excellent aging properties, and improved riding qualities, it was said. In the adhesives field, high bond strength plus ability to be loaded with low-cost resins and fillers makes neoprene adhesives of real interest to the cement manufacturer. A special latex, Type 572, has been developed for adhesives formulation.

The use of neoprene latices as paper and fiber saturants is relatively new, and Type 700 latex has properties that make it of interest as a saturant for gasketing materials, imitation leather, and inner soling. Type 700 also appears to have considerable merit in the rug and fabric backing field where the superior natural aging properties of neoprene and the ability of this latex to be heavily compounded with resins and fillers to produce low-cost, high-efficiency compounds are important.

Mr. Walsh concluded his talk with a discussion of some new special applications of neoprene latices, such as acting as a bonding agent for glass fibers when compounded with colloidal silica, and use with cements of high aluminum content to produce flooring compounds which are scuff, acid, and flame resistant. Other applications for neoprene develop as new latices are made. For example, a catonic-type neoprene latex was found useful for impregnating wool.

Mr. Thies, in discussing the Pliolites, reviewed first the products developed before the war from cyclized natural rubber which were used in manufacturing protective, decorative, and functional coatings for steel, wood, concrete, paper, and other materials and were also used for rubber reinforcing and compounding. He then traced the work on the new resins which was carried out during and after the war, first, from cyclized polyisoprene synthetic rubber and later from copolymer-type butadiene-styrene resins. This discussion covered Pliolites S-1, S-2, S-3, S-5, and S-6. Considerable data were given to show the effect of Pliolite S-6 on GR-S, nitrile-type rubbers, and natural rubber. Special emphasis was given to the compounding of GR-S and nitrile-type gum stocks with S-6.

This paper on Pliolite resins we will publish in an early issue.

Addresses Ontario Group

THE Ontario Rubber Group, C.I.C., held a dinner-meeting at Diana Sweets, Toronto, Ont., Canada, on March 7. E. R. Rowzee, director of research of the Polymer Corp., Sarnia, Ont., spoke on "Synthetic Rubber in Canada and Abroad." He reviewed his recent trip to England and some of the other European countries. It appears that England, Norway, and Sweden will use nearly 100% crude rubber because of their lacking dollar credit, unless a wide price differential between crude and GR-S rubbers should develop. The other countries expect to use about 25-35% synthetic rubber in mechanical goods and passenger-car tires and tubes. Mr. Rowzee also stated that there are three GR-S producing units in Germany at present, all operating at one-half their prewar capacity, i.e., 5,000 tons per month. The German Buna S-3 is superior to standard Buna S in physical properties, but is rather poor in processing. The speaker pointed out that the Redox polymerization technique appears interesting. It uses an oxidizing and reducing catalyst which gives a completed reaction at 32° F. in one hour. He indicated that adoption of this method would enable plants on this continent to have a truly continuous process in the manufacture of GR-S.

Polymer Corp. will be producing high-solids GR-S latex about the middle of this year, Mr. Rowzee further declared. The company's GR-S pilot-plant produces up to one ton of special GR-S polymers, and there is a new Butyl pilot-plant under construction. The rubber trade here can expect a reduction in the price of GR-S about the middle of the year, perhaps to as low as 15¢ per pound. Polymer is now producing four types of GR-S and importing others from the United States. The future success of Polymer depends on improving product quality, which Mr. Rowzee was quite confident would be done. The speaker pointed out that the plant could operate just as economically at 35 to 40,000 tons a year as at the present 60,000-ton level. In addition, the company produces four hydrocarbons of high purity which can amount to some 20 million dollars a year additional business.

Vila and Mighton Speak before Ohio Group

GEORGE R. VILA, sales manager for Colloids and Plastics of Naugatuck Chemical Division of United States Rubber Co., and Charles J. Mighton, Akron branch manager of the rubber chemicals division, E. I. du Pont de Nemours & Co., Inc., were guest speakers at a meeting of the Southern Ohio Rubber Group on February 20. The dinner-meeting, held at the Young Women's League Auditorium, Dayton, was attended by approximately 160 members and guests.

The meeting was opened by Jack E. Feldman, a member of the organization committee, who announced the results of the Group elections of officers and directors. He introduced the chairman, Roger R. Hickernell, who then presided over the meeting. The minutes of the organizational meeting were read by the secretary, and approved by the Group, which also heard the treasurer's report. The Group's proposed by-laws were briefly discussed and approved. Harry E. Outcault, vice chairman of the Division of Rubber Chemistry, A.C.S., was then introduced and spoke briefly on his work as liaison between the various rubber groups and the parent division. He described some of the other groups and complimented the Southern Ohio Group on the quality and attendance of its initial meeting.

It was announced that the next meeting of the Group will be an outing on May 24. Further details will be revealed at a later date.

Growth of Latex Industry

Mr. Vila's talk, "Growth of Latex Industry in U. S. A.," was accompanied by slides showing industry statistics. The domestic latex industry is growing very rapidly, Mr. Vila said. Total consumption for 1946 was approximately 110,000,000 pounds, including natural and synthetic types, as compared with 75,000,000 pounds in 1940 and 30,000,000 pounds in 1935. On this basis, consumption is expected to be somewhere between 150 to 250,000,000 pounds a year by 1950, or shortly thereafter.

The relative proportions of natural and synthetic latex which will be used in making up this total will depend on relative price and availability, the speaker noted. Although the quantity of natural latex coming into the country will undoubtly increase sharply over the years ahead, it is expected that it will not be nearly enough to satisfy the total demand. Fortunately, the industry can depend on synthetics to augment supply as well as to stabilize prices.

A study of the probable demand for natural latex at different price levels, and a consideration of the probable supply in relation to demand, lead to the conclusion that natural latex will probably remain at a relatively high price level for some time to come, Mr. Vila declared. In the meantime research work is continuing on synthetic rubbers and latices, and it is not unreasonabl to suppose that synthetic varieties will ultimately be produced which will be superior to the natural product in all respects.

Neoprene Latices

Mr. Mighton's subject was "Neoprene Latices — Their Development and Use." Neoprene latices have played an important part in the rapid growth of the latex industry. When first introduced in 1932, neoprene latex was expensive, and its use limited to specialty items. Today six different types of neoprene latex are being used in practically all natural latex applications as well as in specialty products. Four of the present latices, Types 571, 842, 60, and 601, may be considered as general-purpose latices. Types 571 and 842 are latices of $50\pm1\%$ solids content. Types 60 and 601 latices contain $59\pm1\%$ solids content and can be used also in making froth sponge, molded or coated goods, and certain dipped articles.

Type 572, of $50\pm1\%$ solids content, is designed specifically for use in adhesives. It shows much greater pressure sensitivity than the other neoprene latices and gives unusually high bond strength in the uncured state. The sixth latex, Type 700, also of $50\pm1\%$ solids content, was designed for use as a paper or textile impregnant and coating and as a plasticizer for the other neoprene latices. It shows a minimum tendency to freeze or crystallize in the uncured state, and after curing is characterized by relatively low modulus and high elongation.

All of these neoprene latices are highly alkaline and show excellent stability toward compounding and storage. With but few exceptions, they are compounded and processed in the same manner as natural latex. In addition to the well-known modifications in metallic oxide and sulfur content, Types 571, 60, and 572 latices require use of special accelerators. With the development of Types 842 and 601 latices, a much closer approach to natural latex has been made from the standpoint of method and rate of cure, and acceleration. Antioxidants, fillers, pigments, stabilizers, and thickeners of the same general types as those used for natural latex are employed in neoprene latices for essentially the same purposes.

Processing techniques are smiliar to those for natural latex. However somewhat longer periods of leaching and drying of neoprene articles before curing are required because of slower rates of diffusion of salts and water through the films, and in certain cases longer cures or higher curing temperatures are desirable. The present synthetic latices no longer present the difficult compounding and processing problems encountered with some of the early types. There is good reason to believe that currently available synthetic latices and new improved types developed through further research will continue to be an important factor in future expansion of the latex industry, Mr. Mighton said in conclusion.

A. C. S. Honors Hancock

THE American Chemical Society honored John M. Hancock, New York banker and outstanding public citizen, at a luncheon at Hotel Commodore, New York March 7, for his efforts in connection with a report on the organization and administration of the Society, recently made public. Mr. Hancock has been chief adviser and writer for Bernard Baruch, preparing much of the 1942 Rubber Survey Report and later the recommendations on contract termination. More recently he has become better known through his activities in connection with the United Nations Atomic Energy Commission.

Speakers at the luncheon, in addition to Mr. Hancock, were W. Albert Noyes, Jr., head of the department of chemistry at the University of Rochester and president of the Society, and Charles Allen Thomas, vice president of the Monsanto Chemical Co., and president-elect of the Society. Walter J. Murphy, editor of the A. C. S. publications, *Industrial and Engineering Chemistry* and *Chemical and Engineering News*, and director of the A. C. S. News Service, presided and introduced the speakers.

Mr. Hancock spoke on the "Role of Science in Achieving World Peace." He first commented on the preparation of the report on the American Chemical Society and said that it was one of the most interesting experiences he had ever had. Scientists must assume a greater share of leadership in local as well as national affairs if they are to meet their new responsibilities in the atomic age, this report states. It also comments on unionization of chemists, suggests strengthening the activities of the Society's 116 local sections, recommends increased emphasis on regional meetings, and suggests several changes in the structure of the Society to meet modern needs. The report will be submitted to the board of directors for action during the Society's one hundred and eleventh national meeting in Atlantic City, N. J., April 14 to 18.

With regard to comments of science and world peace, Mr. Hancock suggested that national security rather than freedom of research should be the first goal of scientists in democratic countries. A cautious approach to free international exchange of information also was urged, and it was pointed out that such an exchange, although clearly worth while, must depend on cooperation among nations and cannot develop if it is to be a "one-way flow."

Although acclaiming the dramatic contributions of scientific research to human welfare in recent years, Mr. Hancock expressed the view that there is too wide an acceptance of the belief that all corporations should engage in research, and that research, almost regardless of its direction or lack of it, will certainly be advantageous.

"In my opinion, business generally will not, and it should not, engage in any blind following of a program of research, except from deliberate judgment that the world will be the gainer, and in that way, the corporation will prosper."

Dr. Noyes in his talk explained that chemists, chemical engineers, and scientists generally, today are anxious and willing to leave their ivory towers and to participate in the political, social, and economic thought of the country, but momentarily there is no unanimity of thought as to just how they should participate, to what extent, and just what are the responsibilities of scientists to society. It appears that this is a field that requires cultivation and that in the past we have neglected our obligations, he said. Leadership in the approach of the problem should be taken for chemists and chemical engineers by the largest scientific and professional organization in the world—the American Chemical Society.

Dr. Thomas concurred with the previous speakers in agreeing that scientists have new responsibilities as a result of the late war. We are entering upon the "atomic age," and this demands that those individuals responsible for its inception have a moral and social accountability to the people of the work, he added. The reason for the investigation of the Society by Mr. Hancock was explained as the first step in deciding how those scientists represented by the American Chemical Society should go about accepting new and broader responsibilities.

Committee D-11, A.S.T.M., Holds Spring Meeting

THE American Society for Testing Materials, Committee D-11 on Rubber and Rubber-Like Materials and most of its subcommittees, met at the Benjamin Franklin Hotel, Philadelphia, Pa., on February 26 and 27, as a part of the spring meeting of the Society. Simon Collier, Johns-Manville Corp., chairman, and A. W. Carpenter, B. F. Goodrich Co., secretary, presided at the meeting of the full committee on the afternoon of February 27. It was announced that Committee D 11 plans to sponsor a symposium on rubber to be held at the annual meeting of the Society at Atlantic City, N. J., the week of June 16. It is expected that the symposium will present a wealth of information obtained during the war through Office of Rubber Reserve and other government agencies in connection with the development, manufacture, and use of synthetic (American) rubber. The data will be timely since they could not be made available previously owing to wartime restrictions.

Subcommittee IV on Protection of Persons from Electric Shock has been reorganized, and its personnel enlarged. This subcommittee will undertake a number of projects formerly carried on under the American Standards Association War Committee J-6 on Lineman's Rubber Protective equipment and will function as a sectional committee under A. S. A. procedure. It was reported that the specifications for rubber gloves (D120) will be revised and that consideration is being given to an ozone resistance test for this type of rubber insulation.

Subcommittee V on Insulated Wire and Cable discussed at its meeting specifications for thermoplastic jackets, also requirements for insulated conductors of small diameters and requirements for moisture - resistant insulating compound. These matters will receive further study.

Subcommittee XI on Chemical Analysis is devoting considerable effort to work with government agencies in connection with revision of that part of Federal Specification ZZ R601A having to do with the chemical analysis of rubber and rubber products. Methods for the determination of sulfur are being reviewed particularly. A review of the methods for the determination of carbon and cellulose is also being made.

Subcommittee XIV on Abrasion Tests recommended a revision in the Standard Methods of Test for Abrasion Resistance of Rubber Compounds (D394-46) providing for the elimination of Method C, which covers the use of the United States Rubber Co. Abrader. A report on the correlation of laboratory and service abrasion tests was made in which the inadequacy of the correlation of these tests was pointed out. The general consensus of opinion was that a fundamental study of the mechanism of abrasion was needed.

Subcommittee XV on Life Tests is giving consideration to methods for the aging of vinyl chloride and a long-time cooperative investigation of air-oven test methods for synthetic rubbers. This latter project would include a shelf aging test for periods of six months, one year, and two, three, and four years, and arrangements have been made for sufficient samples for two additional longer time periods after the four-year period has been reached. Other matters under consideration include a study of GR-S aging data and the effect of miscellaneous properties (temperature and light and atmosphere and contact with the material) on the life of rubber and rubber-like materials.

Subcommittee XVII on Tests of Hardness, Set and Creep recommended that Standard Methods of Test for Compression Set of Vulcanized Rubber be amended to permit the use of plied up samples when it was impossible to obtain a sample ½-inch thick from the test part. A report on the revision of the method for testing the indentation of rubber was read, and the subcommittee voted to ask D-11 to issue this report without revision in the annual report now being prepared.

Subcommittee XX on Adhesion Tests presented an extensive revision of the Standard Method of Test for Adhesion of Vulcanized Rubber to Metal (D429-39) comprising changes in the present procedure for testing the strength of adhesion of rubber to metals in articles where the parts consist of metal and rubber, but having the metal plate on one side only of the rubber strip. The method is designed primarily to apply to specimens prepared in a laboratory under standardized conditions such as may be used to provide data for development and control of rubber compounds and methods of manufacture. The revised methods also provide a standard adhesion terminology for reporting the results of the test.

Subcommittee XXIV on Tests for Coated Fabrics discussed at length cooperative studies to be undertaken on abrasion tests. Consideration will be given to the Taber abrader, the American Seeding Co. abrasion machine, and the Wyzenbeek machine. The committee has also been interested in scrubbing tests for fabrics, and at the meeting there was exhibited the scrubbing test apparatus developed by the Ordnance Department.

Subcommittee XXV on Low Temperature Tests heard a report on low-temperature dynamic tests and discussed the preparation of write-up on the use of the Yerzley osillograph to be made in collaboration with Technical Committee A and Subcommittee XXVII on Resilience. Investigations are to be made with regard to the extension of the 72-hour test period for low-temperature tests and low-temperature set tests.

Subcommittee XXVI on Plasticity Tests reported preparation of methods covering tests for processability which will include the Mooney viscometer and others. It is planned to present these proposed methods for publication as information only.

Subcommittee XXVII on Resilience has prepared definitions and explanations of the following terms as a basis for its activities: resilience, hysteresis, dynamic modulus, and damping. The Yerzley osillograph has been adopted as one machine for use by this subcommittee in its investigation of resilence, and a series of co-operative tests will be started as soon as possible.

Status of GR-S Discussed

THE winter meeting of the Detroit Rubber & Plastics Group, Inc., was held February 28 in the Detroit Leland Hotel, Detroit, Mich., with some 125 members and guests attending. Speaker of the evening was Frank K. Schoenfeld, technical vice president of B. F. Goodrich Chemical Co., whose topic was "Status and New Developments on GR-S Rubber."

Dr. Schoenfeld first reviewed the history and development of the various synthetic rubbers in England, Germany, and the United States and then discussed the factors behind synthetic rubber research in these countries. After a brief review of prewar and wartime productions of synthetic rubbers in this country, he considered the present comparative positions of natural and synthetic rubber, particularly GR-S. He pointed out that for adequate comparison, synthetic rubber must process as easily as natural on existing equipment, and the resulting synthetic vulcanizate must perform as well as the natural product. From a compounding viewpoint, synthetic rubber is comparable to natural, Dr. Schoenfeld stated, but is inferior in resistance to flexing, low temperature, and cut growth, as well as in having greater heat built-up. However GR-S-10, a rosin soap GR-S, has been developed which is easier processing and has greater building tack than the standard polymer.

From a summation of all considerations, the natural product is slightly superior to the synthetic product, but in the future we will have a series of new rubbers for specialty applications which will perform better than the natural product in these uses. The speaker noted that if synthetic rubber cannot compete with natural on quality, it may well be able to compete in price. Synthetic rubber can be produced for 15 to 17¢ a pound, including all costs and a modest profit. The price of natural rubber is more uncertain. Although it could be delivered in New York Harbor for 8¢ to 10¢ a pound without outside control or profit, such an eventuality is unlikely. Such factors as availability of labor in the Far East, availability of high-yield trees, political developments, and government regulation will undoubtedly require that natural rubber be sold for more than synthetic. Although the price of natural rubber is increased by the higher demands of plantation laborers, this factor is balanced by the large labor pool in the Far East and the fact that 50% of the rubber trees are native owned. In addition, high-yield rubber trees planted before the war are now ready for tapping, another factor in favor of lower priced natural rubber. In conclusion the speaker stated that the government will have to decide on some method of control for the synthetic rubber plants, but expressed the hope that private industry will control these plants and that research and development will continue in this field with the new discoveries made by private industry protected under our patent system.

Chairman J. P. Wilson announced that the group's next meeting would be held at the Detroit Leland Hotel on May 16, and that the principal speaker would be announced at a later date. The Group voted for a summer outing, including a golf tournament and clam bake, to be held the latter part of June.

Quebec Group Meeting

THE Quebec Rubber & Plastics Group held its regular monthly meeting on March 13 at the Ritz Carlton Hotel, Montreal, P. Q., Canada. Guest speaker was A. R. Kemp, of Bell Telephone Laboratories, Inc. Mr. Kemp, who is in charge of Bell research and development on rubber insulating materials and plastics for wire and cable, spoke on "Modern Trends in Rubber and Plastics," using slides to supplement his talk. A film dealing with the Fastax high-speed motion-picture camera was also shown.

Mighton, Stangor, and Shattuck Address Chicago Group

THE February 14 meeting of the Chicago Rubber Group, held at the Morrison Hotel, Chicago, Ill., featured two speakers from the new Akron laboratories of E. I. du Pont de Nemours & Co., Inc., C. J. Mighton and E. L. Stangor.

Dr. Mighton spoke on "New Outlets for Rubber through Latex." He traced the development of new products from natural latex, beginning with the original uses for dipped goods, proofing and adhesives, and ending with the development of latex foam sponge and latex-bonded fibers. As manufacturers are able to increase their production, Dr. Mighton said, they will have more opportunity to produce tailor-made latices with special properties to suit specific requirements. Research on latices is continuing at a rapid pace, and new developments may be expected in the near future.

"Backrinding of Molded Rubber Products" was the title of Mr. Stangor's talk. He described the causes of the torn or gouged condition which occasionally occurs at or near the mold parting line of a vulcanized cylindrical slug or rectangular block. The sudden release of internal pressure resulting from thermal expansion of the compound forces the vulcanized rubber past the sharp edges of the parting line, thereby gouging a piece out of the finished article. Several of the factors which can reduce backrinding are the use of a proper amount of compound in relation to the mold cavity, increasing the amount of inert filler, increasing use of fillers with lower thermal expansions, curing at lower temperatures, and preheating the unvulcanized stock. Cooling the mold under pressure is a solution, but this step can be used only infrequently because of the longer time involved. Proper design of the molds to eliminate distortion, when the mold is opened, is also an advantage.

In addition to the speakers, the Group also saw a motion picture of the 1946 championship football game between the Chicago Bears and Chicago Cardinals, with Jay Berwanger, former University of Chicago star, explaining the action of the game and relating some stories from his own football career.

No Group meeting will be held in April, and the annual election of officers will take place at the May 9 meeting. The speaker and the topic for this session will be announced at a later date.

Robert Shattuck, of Marbon Corp., was guest speaker at the March 21 meeting of the Chicago Rubber Group, also at the Morrison Hotel. Mr. Shattuck, whose topic was "Bonding Rubber to Metal with Ty-Ply," described the requirements for a good adhesive as follows: (1) one-coat application; (2) low cost; (3) suitability for use in a conventional rubber cure; (4) application as simple as applying a coat of paint; (5) versatility for use with a wide range of stocks of various hardnesses; (6) high bond strengths at both high and low temperatures; and (7) permanency of adhesive film location.

The use of Ty-Ply Q for non-oil resistent rubbers, such as natural rubber and GR-S, and the use of Ty-Ply S for oil resistant rubbers, such as neoprene and nitrile rubber, were then described. The preparation and application of the adhesive was covered in some detail by the speaker, as was the preparation of the metal and the compounding of the rubber stock being bonded. Several slides illustrated the type of bond obtained with Ty-Ply, and failure was shown to occur in the rubber stock itself, rather than in the bond.

One very desirable property of the Ty-Ply bond is that the strength at curing temperatures is high enough to permit easy removal from a hot mold. The limiting factors in this case would lie in the rubber stock *itself*, rather than in the bond. After the talk, an extended discussion period was held in which Mr. Shattuck was joined by Gus Maassen, of R. T. Vanderbilt, Inc., in answering questions from the floor.

In addition to the speaker, two sound films furnished by Firestone Tire & Rubber Co. were shown. The animated cartoon, "Building a Rubber Tire," showed every phase of tire production from the latex to the finished tire. The second film was on the 1946 Indianapolis Speedway Race and reviewed the history of the race and the improvements in automobile design which grew out of information gained during the races.

Army Tire Road Tests

THREE years of running a rock road tire testing laboratory for the Army were described for the members of Los Angeles Rubber Group, Inc., at their predinner technical meeting on March 4 at the Mayfair Hotel, Los Angeles, by James J. Robson, former lieutenant colonel, who served as chief of the ordnance department's rubber division. Mr. Robson, now returned to his peacetime position as manager of manufacturers' tire sales for Firestone Tire & Rubber Co., illustrated his talk profusely with slides depicting the grueling terrain upon which tires were tested and graphs showing mileage record performances of various types and sizes of natural and synthetic rubber tires.

Among the points brought out by the speaker were that small tires in the 6.00-16 category in almost all synthetic rubbers stood up in the tests, but that the larger sizes, from 7.50-20 and up, chipped and chewed up badly, especially the original "S" tires. Truck tires in the 9.00-20 size and larger developed severe cracks due to high heat build-up, a problem the Army was never able to solve. The Burma Road was the toughest spot in the world for tires, Mr. Robson stated, with first-grade natural rubber tires being good for only an average of 2,500 miles, and synthetics good for only 1,500 miles. He showed slides of "Burma Road gravel," which were large, jagged chunks of rock six to eight inches in diameter.

Comparing Army performance of natural and synthetic tires, Mr. Robson declared that synthetics developed twice as many bruise failures as natural tires. One of the biggest blows to hopes for good synthetic tires, he said, came when neoprene tires, which had shown many desirable characteristics, proved such dismal failures in cold climates. He described tests made in Alaska with neoprene tires at 30-40° below zero when a sharp hammer blow would shatter the frozen casing or tube. A truck was once allowed to remain out all night, and the air then let out of the neoprene tires. The truck drove off without even flexing the frozen neoprene, but when it hit a bump the tires broke into pieces.

After the dinner meeting, Lt. Edwin H. Lombard, of the U. S. Navy, described the personal woes of a military governor in the South Pacific "looking for civilians to govern," and the group viewed color motion pictures taken by the Navy at "Operation Crossroads," the Bikini atom bomb tests.

The annual TLARGI golf tournament was scheduled for March 14 at the San Gabriel Country Club.

Howlett Treats of Butyl

Members of the Los Angeles Rubber Group heard a history of Butyl rubber and actually saw the product made at their pre-dinner technical meeting on April 1 at the Mayfair Hotel, with R. M. Howlett, of the technical service division of Enjay Co., as the lecturer and demonstrator.

Mr. Howlett reviewed the discovery of Butyl by Sparks and Thomas, the prewar laboratory and pilot plant program, and the wartime production of Butyl. After describing the essential features of the Butyl process, the speaker then actually synthesized the rubber for the audience. He drew a mixture of isobutylene and and isoprene in an inert solvent from a cylinder into a beaker containing dry ice. A Friedel-Crafts type of catalyst was then added to the cold mixture, and the reaction formed a rubbery white solid, Butyl rubber.

The remainder of the talk was devoted to a discussion of the properties of Butyl compounds. Its low permeability to gases and high resistance to aging and wear are properties which make Butyl outstanding for inner tubes. Butyl also has excellent electrical properties, ozone resistance, and low water absorption, all of which make it ideal for use in wire and cable insulations and jackets. Butyl is also resistant to the action of strong acids and chemicals.

At the dinner meeting, Richard Atkinson, lecturer and radio commentator, spoke on "Russia — Past and Present" and gave his impressions of the Russian people. The meeting was closed with a showing of a film, "Oil from the Earth," presented by C. L. Towers, of the Shell Oil Co.

Butyl Rubber Discussed

THE Northern California Rubber Group held a meeting on March 20 at Angelo's Restaurant, Oakland. Principal speaker was Mr. Gullekson, of the California Research Corp., whose topic was Butyl rubber. He reviewed the history of Butyl, starting with its origination in Germany as Oppanol rubber, its development here in the United States by Standard Oil Co., its wartime production, and its present status and uses, particularly for the manufacture of inner tubes. Mr. Gullekson noted that the physical properties of Butyl result from the chain-like configuration of the polymer molecules, and that its chemical nature governs its response to vulcanization and the addition of fillers and other modifiers.

Ross Morris of the United States Navy's Mare Island rubber laboratory, was asked to give an additional discussion on the applications and compounding of Butyl. He stated that because of its low degree of chemical unsaturation, Butyl vulcanizes more slowly than natural rubber and therefore requires high acceleration. Its incompatibility with unsaturated oils and other polymers is due to their stopping this vulcanization of Butyl. Certain physical properties of Butyl can be traced to its chemical composition. It is extremely high in extensibility because of its infrequent double bonds. It has a tendency to depolymerize during sulfur curing. It has a high chemical resistance and is much less permeable to air than other elastomers. Like neoprene, Butyl is strong in the pure gum

state. By use of proper tie-gum materials, Butyl can be bonded to metal.

Joseph Crosby, of Thiokol Corp., was a surprise guest at the meeting and spoke briefly on his company and its aims for future business and research. At the business meeting preceding the technical session, the Group heard reports from its treasurer and the chairmen of the membership, summer outing publicity, and program committees.

The Group's next meeting, the date of which is to be announced, will be on the "Influence of High Polymer Technique on the Rubber Industry." Guest speaker will be George H. Brother, head of the industrial products division of the Western Regional Laboratory, U. S. Department of Agriculture, Albany, Calif.

Gates Group Meeting

THE Gates Technical Club held a dinner meeting on February 20 at the Cosmopolitan Hotel, Denver, Col. The attendance of 135 was the largest in the group's history and included, as guests, some 25 Gates industrial field engineers from every section of the country. A regular business meeting was conducted by the club president, Walter Redmond. Guest speaker at the technical session was Walter O. Roberts, director of the High Altitude Observatory at Climax, Col., who spoke on "Storms on the Sun." Dr. Roberts' talk concerned sun spots and other solar phenomena and was accompanied by some spectacular motion pictures of the sun's corona. In addition to his talk Dr. Roberts also gave interesting comments and discussions on atomic fission, rockets, interplanetary travel, and other related topics.

Make Your Hotel Reservations!

THE officers of the Division of Rubber Chemistry, A. C. S., have recently been receiving requests from some members of the Division for a postcard on which they can make hotel reservations for the meeting scheduled for Cleveland O., May 26-28, at the Hotel Cleveland. No such postcard will be supplied, but the procedure for making hotel reservations was outlined in a letter to the members by the secretary of the Division, C. R. Haynes, Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y., under the date of January 15, 1947. The final paragraph of this letter said:

"The headquarters hotel is Hotel Cleveland, Public Square and Superior Avenue, and rooms for use at this meeting will be available in the following hotels — Cleveland, Statler, Hollenden, and Carter. *All reservations should be addressed to Hotel Cleveland,* and if you desire any certain hotel, please so specify in your letter. After the allotted number of rooms at the Hotel Cleveland is used up, any other reservations will be distributed by the Cleveland Convention Bureau among the other three hotels listed above."

The above procedure for obtaining reservations at Cleveland was also published in the February, 1947, issue of India Rubber World on page 674, in connection with our report on the plans for the May meeting of the Division of Rubber Chemistry.

At Northern California Group Meeting: (L. to R.) George Petelin, of Goodyear Tire & Rubber Co.; Bill Elwell, of California Research Corp.; Mr. Crosby; and Mr. Gullekson

Philadelphia Group Meeting

THE Philadelphia Rubber Group will hold its annual spring meeting on May 16 at Kuglers Restaurant, Philadelphia, Pa. Guest speakers will be W. R. Smith, chief research chemist, and B. A. Wilkes, both of Godfrey L. Cabot, Inc. Their subject will be "Recent Advances in Carbon Black Technology and Their Applications to the Rubber Industry."

CALENDAR

Apr. 1.	**Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.**
Apr. 8-11.	**American Management Association. Conference on Packaging, Packing, and Shipping; and Packaging Exposition. Convention Hall, Philadelphia, Pa.**
Apr. 10.	**Quebec Rubber & Plastics Group.**
Apr. 10.	**Rhode Island Rubber Club.**
Apr. 11.	**New York Rubber Group, Hotel McAlpin, New York, N. Y.**
Apr. 14-15.	**Safety Convention and Exhibit. Industrial Accident Prevention Associations. Royal York Hotel, Toronto, Ont., Canada.**
Apr. 14-18.	**American Chemical Society. Spring Meeting. Atlantic City, N. J.**
Apr. 22.	**Buffalo Rubber Group—Ontario Section. Joint Meeting. General Brock's Hotel, Niagara Falls, Ont., Canada.**
May 5-11.	**Plastics Exposition and Annual Meeting. Society of the Plastics Industry, Inc. Coliseum and Hotel Stevens, Chicago, Ill.**
May 6.	**Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.**
May 8.	**Quebec Rubber & Plastics Group.**
May 9.	**Akron Rubber Group.**
May 16.	**Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.**
May 16.	**Philadelphia Rubber Group. Kuglers Restaurant, Philadelphia, Pa.**
May 24.	**Southern Ohio Rubber Group. Outing.**
May 26-28.	**Division of Rubber Chemistry, A.C.S. Spring Meeting. Hotel Cleveland, Cleveland, O.**
June 1-6.	**SAE. Summer Meeting. French Lick Springs Hotel, French Lick, Ind.**
June 3.	**Los Angeles Rubber Group, Inc.**
June 8-10.	**Chemical Institute of Canada. Banff Springs Hotel, Banff, Alta., Canada.**
June 12.	**Quebec Rubber & Plastics Group.**
June 16-19.	**ASME. Semi-Annual Meeting. Stevens Hotel, Chicago, Ill.**

Safety Council Meeting

THE executive board of the Rubber Section of the National Safety Council met in Akron, O., on January 31, with chairman Roland Kastill, of United States Rubber Co., presiding. George Burkhardt, of General Tire & Rubber Co., who is chairman of the engineering committee, reported that work is nearly completed on a binder of standard practice forms for the rubber industry. F. A. Van Atta, Safety Council staff representative, was instructed to draw up plans for dividing the Rubber Section Safety Contest into more groups based upon the size of the companies entered.

1945 Carbon Black Production and Sales

PRODUCTION and sales of carbon black rose to new peaks above one billion pounds in 1945, according to statistics in a chapter on carbon black by F. S. Lott and H. Backus in the "Minerals Yearbook, 1945," of the United States Bureau of Mines. The 31% gain in production to 1,052,798,000 pounds exceeded the demand for the first time since 1942, as sales increased only 9% over 1944 to 1,020,035,000 pounds. Producers' stocks continued at minimum levels until the end of hostilities in August, subsequently rising to 102,005,000 pounds on December 31, 1945, as compared with 69,243,000 pounds at the end of 1944.

The statistics are based on the reports of 21 producers, comprising 59 plants. Production in 1945 in Louisiana was 168,229,000 pounds, in Texas 721,438,000 pounds, and in other states 163,131,000 pounds. Of the carbon black produced, 538,539,000 pounds were made by contact processes, principally channel, and 514,259,000 pounds were made by furnace processes. Of the 846,262,000 pounds sold in the domestic market in 1945, 804,386,000 pounds went to the rubber companies, 22,824,000 pounds went to ink companies, 7,421,000 pounds went to paint companies, and 11,631,000 pounds were used for miscellaneous purposes. The production of contact-process blacks increased 30% over 1944 and established a new record 8% higher than the former peak of 1940. Output of furnace black showed a gain of 33% over 1944.

Copies of a preprint of the chapter on carbon black are for sale at a price of 5¢ each by the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C.

Hysteresis Reprints Available

At the request of some of our readers we prepared reprints of the article, "Hysteresis and Methods for Its Measurement in Rubber-Like Materials," by J. H. Dillon and S. D. Gehman, which appeared in our October and November, 1946, issues.

Those interested may secure copies of this pamphlet at 50¢ each by writing direct to India RUBBER WORLD, 386 Fourth Ave., New York 16, N. Y., and orders will be filled as long as the supply, which is limited, lasts.

Plastics Technology

1947 Materials Picture[1]

F. H. Carman[2]

THE supply of plastic materials, expansion plans of the industry, and probable future availablity were reported several times during 1946.[3] Without doubt, these reports have come to the attention of most members of the industry and require no repetition at this time. Since preparation of these detailed estimates on what has been done and what will be done, there have been major developments worthy of notice and comment as to how they affect the present supply of materials and the future prospects.

These might be listed as:

(1) The change in supply-demand status for molding materials. The thermoplastic picture has improved to the point that supplies are generally equal to requirements. The expansions promised the industry have begun to come in and have materially relieved the tight situation reported in 1945 and 1946. Some would say that there is now a buyer's market in this particular branch of the industry. To the contrary, thermosetting molding materials, although operating at substantial high levels, are extremely short.

(2) Delays in the expansion program of the materials producers, in many instances from three to six months, are no longer delaying production. Now, it is a raw material supply problem!

(3) It has been mentioned many times before that the industry is now of a magnitude that such large amounts of basic chemicals are used for plastics that anything affecting supply of basic materials consequently affects this industry. Any curtailment in the production of soda ash, chlorine, coke, and coal tar for any reason ultimately affects plastics production. Now, more than ever before, any increase in plastics can only be possible with corresponding increases in basic chemicals.

(4) With the plastic materials manufacturing operations at the present levels and particularly the improved supply status for many of the materials, the molders, fabricators, engineers, and designers can count on ample supplies and now have increased assurance in planning to use these materials in 1947 and the years ahead. In this respect the plastics group has an advantage over certain other industries producing engineering materials.

PMMA members have supplied many pertinent details regarding the present and future materials supply prospects. It would be useless to repeat again a lot of figures on what has been done on specific materials and the probable future growth figures. The record is already available through various publications, and the estimates and forecasts in many cases have been exceeded except where strikes have cut off supplies.

There is also little point in dwelling on the effect of strikes in any detail. All industries, and plastics is no exception, lose materially with major strikes; the 1946 coal and steel strikes are still preventing full production.

Because the availability of plastic materials in the future is so dependent upon raw material supplies or basic chemicals, it appears appropos to discuss briefly the prospects for those needed by this industry before going into details on the specific types themselves. The picture in many instances is confusing; curtailments in one segment of the industry are not the same in another manufacturer's operations; and the overall picture is further clouded by general industrial chaos throughout the world. Plastic material producers must compete with other industries such as drugs, paint, agricultural chemicals, rubber and glass for the materials to keep operating. In addition to the domestic demand the desire to export because of the extreme shortage in other countries cannot help but come into the picture.

Practically every PMMA member commenting on the tight supply situation has covered the basic chemical situation. Therefore a few of the pertinent problems in raw material supplies as they may affect the immediate future are worthy of calling to your attention at this time.

Coal-Tar Chemicals

Production in 1946 for most of the coal-tar chemicals was off from the 1945 totals. There is little need to dwell on the reasons for this condition; many of these have already been reported to the industry in various publications. Briefly, the important items are benzol, off about 12%, naphthalene for phthalic anhydride, production of the latter off about 20% from the 1945 figures of 125,000,000 pounds, to result in critical shortages of many plasticizers, especially in the thermoplastic field.

Production now appears to have recovered from the 1946 low, and 1947, we are told, should outdistance last year's output; however the huge industry requirements will keep supplies tight during the most of 1947.

Many of the industry have called attention to the long-range shortage of benzol as the greatest deterrent to expansion and increased production of synthetic phenol. For the reasons already outlined, this will continue tight during the balance of the year. Because of the increased industrial uses of benzol, it is becoming increasingly apparent that new and more efficient sources of supply must be brought in. This situation appears to offer a chance for the petroleum companies to take care of the gap between supply and requirements of this basic chemical.

In spite of the fact that phenolic plastics are operating at relatively high levels, the production of phenol in 1946 was slightly under that of 1945. Some producers are being delayed by strikes, cold weather with resulting low gas supplies, and necessary maintenance of equipment. The industry regularly obtains a large portion of the synthetic and natural phenol being produced. Here again, plastics must compete with medicinal products, oil additives, fungicides, and other agriculture uses. Based on the first eleven months of 1946, the exports of phenol were a little in excess of 12% of production. This circumstance among others led to the inclusion of phenol, benzol, and phenolic resins in the positive list for export control during the latter part of the year. It is believed the imposition of quotas for such exports will substantially reduce these shipments.

Cresols and cresylic acid, like phenol, are in short supply, with demand so much exceeding availability that it is difficult to make any rational estimates on the future picture except that it will probably continue tight.

Methanol and Formaldehyde

The large producers of methanol and formaldehyde report all uses are being curtailed by current shortage. Conversion of ammonia plants and construction of new facilities for methanol have been delayed because of many equipment problems; one unit was recently held up by strike of the construction workers. The production of synthetic methanol in 1946 was 20% greater than in 1945 in spite of the coal strike; total production of formaldehyde was only slightly less than that of 1945. There appeared to be no substantial exports of either of these commodities. We are told that there is little hope for increased supplies of methanol during 1947.

Miscellaneous Chemicals

The plastics industry could use considerably more urea in molding materials and adhesives during 1947. Even if more formaldehyde were available, the capacity for production of urea would not be materially increased and become effective until 1948.

Glycerin is used in many of the plastic materials and plasticizers. Production in 1946 was approximately 10% under that of 1945; however there was some improvement toward the end of the year. During the first half of 1947 the situation will remain tight, but the long-term picture now appears to be much improved.

The price of cotton linters literally skyrocketed during 1946, and cellulose plastics were thus adversely affected. Recent reports indicate that the price for linters has leveled off and that this picture will improve to some extent.

The supply of caustic soda, despite expansion of facilities, is expected to grow worse this year owing to mounting demands. In the latter part of 1946 the shortage was expected to be overcome early this year; but this seems to have now changed for the worse. This chemical is of particular importance in the manufacture of phenol and similar basic materials.

Generally, the wood flour situation has eased to the degree that it is no longer delaying production of phenolic molding materials. New facilities have been or will be installed shortly to take care of the increasing demands, and it now appears that other basic chemicals are more restricted.

Plasticizers

The availability of good plasticizers is plaguing all users of these materials, particularly the manufacturers of cellulosics and vinyls. Considerable mention has been made of this situation in the trade publications and previous statements by PMMA. At present the problem stems primarily from the critical supply position of coal-tar chemicals such as phthalic anhydride, cresols, etc., although other basic materials such as glycerin, castor oil, and camphor being scarce have contributed to the difficulties. In many respects the future picture is confused, but it is now evident that the supply will not be materially changed within the next six months until new facilities can be brought in.

The Construction Program

Individual spokesmen for the industry have stated that the expansion program

[1] Presented before Society of Plastics Industry, Inc., Pacific Coast Meeting, Santa Barbara, Calif., Mar. 20, 1947.

[2] General manager, Plastics Materials Manufacturers Association, Washington, D. C.

[3] India RUBBER WORLD, 115, 228 (1946).

[4] *Ibid.*, 115, 540 (1947).

for the entire plastics manufacturing group is behind schedule on the average of about six months. The year-end statements in several publications[4] indicated that a number of units were three to nine months late, depending upon the individual circumstances. In several other instances the expansion programs for certain segments have been completed. Compared with construction in other industries with which our producers must compete for equipment and materials, progress by the material manufacturers has been remarkable.

With part of the program completed and the basic chemical situation as already outlined, it can be generally stated that the tight supply situation for certain plastics is no longer due to delays in bringing in capacity increases, but is now primarily a matter of raw material supply.

Regular monthly reports are now being cleared by the Census Bureau on Plastics and Synthetic Resins production. These, together with other public statements during 1946, have provided the industry with detailed information on production trends and particularly the effect of expansions that have been bought in. Needless to say, I am extremely proud of the growth in plastic materials production and the levels that the producers have been able to maintain in face of the many obstacles confronting them.

Thermoplastic Materials

The suppliers report that the gap between availability and requirements for thermoplastic molding materials has materially lessened in the last few months, and generally they are now able to take care of most orders. From this fact it would appear that the expansions and increased supplies promised the industry during 1946 have now become an actuality. The very large increases in supply of the polystyrenes, the acrylics, and cellulosics are currently supplying the demand with the possible exception of certain special classifications. Inventories at the beginning of the year disclosed that some molders had rather excessive stocks of materials, possibly accumulated over a period of years when they purchased anything available. Now that they know they can get thermoplastic molding materials about as quickly as wanted, there is no longer a duplication of orders, and there appears to be a tendency to cut inventories. People are no longer hoarding!

Frankly, with such a tremendous growth in this class of materials as shown by government reports of production and reported several times to the industry, it is only natural that there will be a breathing spell and leveling off of these requirements. The experience during the past 12 months with an economy of rapid change from price and production controls, strikes, etc., has naturally affected the molding industry. The suppliers are as confident as ever of the long-term increasing demand for all these materials and regard the current situation as only a technical recession.

Suppliers of cellulosic molding materials report they are now in a position to furnish more than current requirements. Availability of plasticizers is still not healthy, although up to the present the shortage has not resulted in failure to fill orders.

There is no material change except for improvement in supplies of ethyl cellulose, cellulose acetate sheet, rod, and tube, and many of the special thermoplastic molding materials. In some instances supply of acetate flake is still retarding full production of special grades of film, molding powder and sheet material. Producers of acrylic sheet can now supply substantial quantities with little difficulty.

The future production of polystyrenes is one of conjecture as it is tied up closely with the operations of the synthetic rubber plants and the basic raw material supply as already mentioned. Additional production capacity will be coming in about the middle of the year. The total polystyrene to be made available to the industry in 1947 should without question surpass the forecasts made in 1946. In spite of this point, it is still questionable whether or not the facilities can be used to capacity operation because of supplies of basic chemicals.

Vinyls

The supply of vinyls compared with the requirements has not appreciably changed since the last PMMA report to the industry. In spite of considerable increase in resin production, the demands continue at a high level. Construction delays already mentioned will not permit additional resin facilities until the latter part of the year. The demands in this particular class of plastic materials are so great and so many outlets are as yet untouched that additional production facilities are being planned by various companies.

One producer of a special type of vinyl reports expansion schedule six to eight months behind and stated this state of affairs is due to what now seems to be almost normal causes such as strikes, difficulty in securing construction materials, special equipment, etc.

Ralph David, in reporting on the West Coast industry growth in the injection molding field, reported a capacity to use 25,000,000 pounds in 1947, tripling the consumption of 1945. PMMA's report to the industry in October, 1946, covered the extensive expansion of thermoplastic molding materials which when completed, will provide capacity for 3.6 times that of the 1945 production rate. Certainly the material suppliers are keeping pace with the growth in this area!

Thermosetting Materials

As already mentioned, the supply of thermosetting molding materials continues to be extremely tight, and the same situation holds for thermosetting resins for most other purposes. This is due primarily to critical shortage of basic materials. Many of the expansions reported early in 1946 have been affected, but rate of production has not kept pace with these increases in facilities; the producers generally are plagued with shortages of raw materials previously mentioned.

Phenolic molding materials are currently running at much higher levels than during the war years; and aside from serious cutbacks due to strikes, the level reported for the third quarter of 1946 is still being attained. The most recent report from the Census Bureau indicated phenolic molding powder production of 14,736,000 pounds in January. In spite of this, many segments of the industry are able to operate only a fraction of their capacity, and it now appears that supplies of phenol, formaldehyde, and caustic will not permit capacity operations during any of 1947.

In a recent industry meeting the producers were not willing to forecast more than a 10% increase in 1947 over 1946, and it now appears that it will be 1948 before there is any appreciable improvement in this situation.

Practically the same material situation is faced by the manufacturers of urea molding materials and urea resins for adhesives, etc. It is possible that additional melamine molding materials and resins will be available in the latter part of the year; no great increase in the total amino materials will be possible until the very end of 1947.

Apparently the inflated requirements faced by materials manufacturers in 1946 were not confined to the domestic industry. Similar situations have been reported in the British plastics industry, to the extent that a false demand for both raw materials and consumer goods has been built up. Likewise, the trade reports from the United Kingdom indicate the 1947 outlook, especially for the thermosetting plastics, will continue to be a situation of critical shortages. Even though phenol and cresols are being manufactured in greater quantities than before the war, they will be insufficient to meet demands. Similar situation is faced by the manufacturers and users of amino plastics. At the present time the domestic picture with respect to cellulosics, polystyrene, and other thermoplastic materials appears to be much better than anywhere else in the world.

Summary

In reviewing the forecasts on the material supply situation made during 1946, it is surprising how accurately some have called the turn on the 1947 position. Increased supplies, price increases in some instances, buyers' resistance to inferior goods, and a return to more rational placements of orders for materials coupled with reduction of inventories have brought about a changed and improved situation in thermoplastic molding powder supplies. It now appears that these influences together with some marginal equipment being taken out of production have tended to close the gap between injection molding requirements and available supplies. In contrast to this situation, there is little prospect for much increase in amounts of thermosetting molding materials this year.

The chemical industry has been reported to be operating at production levels at least 10% greater than that of the early part of 1946. With the plastics industry today beset by serious basic material shortages in many segments, it is heartening to know that no significant downward trend from the current levels is expected this year; several have stated that the overall supply should come into balance with demands in the first quarter of 1948. Any group on a sound footing and having a bright future such as the plastics industry cannot permit progress to be limited by shortages of basic intermediates so long as the raw materials can be made available for their manufacture either by known processes or new ones to be developed. However the element of time is equally important to meet the demands of this fast-growing industry, and the material manufacturers certainly would be remiss if they did not insist that the chemical industry undertake the necessary expansions to supply all plastics.

Many forecasts of expansions and requirements have been made, and we believe those made by industry representatives are conservative and based on sound facts. A recent forecast by one of the govment agencies coming to our attention was that the 1946 level of 600,000,000 pounds of molding powder would be increased to 800,000,000 pounds in 1948 and 2,500,000 pounds in 1957; they predicted the industry would run into serious shortages in 1948 in such items as building materials, wood flour, linters, coke oven by-products, and coloring pigments. In view of these facts and the existing outlook for 1947, it is seriously questioned if this balance of supplies of basic chemicals for plastics can be obtained in 1948 and whether or not the chemical industry is preparing to take care of the long-term growth in plastics.

Perhaps others in this conference will

warn that in the coming months there will be a few failures among those molders who started on a shoestring. There willl be many discouraging and gloomy situations; however, the material manufacturers have demonstrated to the plastics industry that they have faith in its continued growth. The expansions promised in a number of cases have already been brought in. Everyone is confident that the rate of consumption for the various types of plastics in industrial parts will remain high with emphasis on consumer products such as automobiles, various electrical appliances, radios, refrigerators, washing machines, motors, and general industrial equipment. In many respects the present materials supply situation for the molder, fabricator, and customer of the plastics industry has changed for the better. Although there are a few shortages in certain types, generally the industry can work on the premise that those things promised in plastics for the world of tomorrow are now here.

Plastics Show and Convention

THE second National Plastics Exposition of the Society of the Plastics Industry, Inc., will be held in the Chicago Coliseum on May 6 to 10, concurrently with the SPI's annual convention in the Stevens Hotel, Chicago, Ill.

SPI Convention

The following convention program has been scheduled by the conference committee, under the chairmanship of W. K. Woodruff, of Celanese Plastics:

Wednesday, May 7: General meeting; forum on "Plastics Must Be Sold."

Thursday, May 8: Compression, Fabricating, Extrusion, Film and Foil divisions meetings; SPI annual meeting and election; ladies' luncheon; and the SPI annual banquet.

Friday, May 9: Injection, Machinery, Low Pressure, Tool and Die, and Accounting divisions meetings.

The opening session of the convention will be devoted to a forum discussion on "Plastics Must Be Sold," in which men prominent in the merchandising field will speak. The annual banquet will have as guests of honor leading engineers who have contributed to the development of the industry, and a nationally known speaker will be invited to address the assemblage. Announcement of the names of speakers will be made at a later date.

Plastics Exposition

The second National Plastics Exposition will be entirely a trade show, with admission limited to industrial, commercial, and press representatives by means of invitation cards distributed by exhibitors. More than 135 exhibitors have already been assigned space for the show. The SPI, comprising more than 600 firms and having a total roster of 1,600, will show the national and international plastics world to an industrial and business audience which, reservations indicate, will be attracted from almost every phase of American enterprise.

Three main phases of the industry will be covered by the show: new products exhibits dramatizing uses never dreamed of five years ago; recent machinery developments for plastics production; and the latest fabricating techniques. Heavily underscored throughout the show and convention will be the almost complete conversion of plastics to peacetime uses. One of the major revelations of the show is expected to be exhibits showing uses of plastics in plants of all sizes and types, as insulators, housings, gears, flooring, wall panelings, electronic fittings, and a thousand other scientific, but "unseen" applications, as contrasted to the "glamorized" household and office plastics.

The booth of the Dow Chemical Co. will feature a complete background of Styron plastic together with Styron mural blocks as part of the booth construction, to illustrate the use of this plastic architecturally. In an imposing 45-foot sweep along the entire booth, the company will display applications of its three plastics, Styron, Saran, and Ethocel. Reception furniture will be upholstered in bright colored Saran fabrics. Personnel who will attend the exhibit, in addition to D. L. Gibb, manager of the plastics sales division, will include representatives of Dow's plastics technical service division and members of the plastics sales force from the company's main office and from offices throughout the country.

New SPI Plastics Service

Household and office users of plastics may refer their questions about plastics to a service being offered by the SPI public relations committee. The committee's chairman, John Sasso, production editor of "*Business Week*, said the service was being offered to the general public because of widespread confusion about plastics and will be a service for consumers only. He also emphasized that the new service would be free of charge and would not be business consultancy. Other members of the committee are: B. F. Henden of Canadian Industries, Ltd.; Don Masson, Bakelite Corp.; Edward J. Pechin, of E. I. du Pont de Nemours & Co., Inc.; and John W. Stokes, of Chicago Molded Products Corp.

Discusses PMMA Services

J. R. HOOVER, president of the Plastic Materials Manufacturers Association, Inc., and vice president of the B. F. Goodrich Chemical Co., spoke on "PMMA and Its Industry Purposes" before the Society of the Plastics Industry Pacific Coast meeting in Santa Barbara, Calif., on March 20. Mr. Hoover said that the PMMA and its resin adhesives division now comprise 20 member companies, all of them engaged in the production and active sales of plastics raw materials to the industry. He emphasized that these are the chemical companies of the plastics business, in contrast with the much larger group of firms who use the materials in mechanical operations for the manufacture of consumer and industrial products.

The Association has its headquarters in Washington, D. C., with General Manager Frank H. Carman heading the staff and maintaining active liaison with the Armed Forces and various government agencies. Among the many specific activities designed to implement its industry purposes, PMMA carries on the following:

Publication of the "Technical Data Book of Plastics," the first comprehensive handbook outlining engineering properties of the various plastic materials. This is completely revised and reissued every two years, and the 1947 edition is now in preparation.

Sponsorship of a five-year $150,000 research project at the Massachusetts Institute of Technology to study the fundamental engineering properties of plastics materials and to develop better test methods.

Materials-supply surveys to keep the industry informed on this subject. The latest summary, presented by Mr. Carman during the West Coast SPI Conference, is printed in full elsewhere in this issue of India RUBBER WORLD.

Cooperation with the Bureau of Census in classifying and supplying data or production and consumption of plastics materials.

In cooperation with the Bureau of Standards, development of commercial color standards for urea and polystyrene molding compounds.

Programs aimed at promoting the safety of workers in plastic materials manufacturing plants, and the improvement of industrial relations. An annual safety contest among plants of member companies is carried on with competitive zest and provides a stimulus to teamwork between employes and plant management.

Public relations activities, particularly where concerted action is needed to counteract misinformation, misapplications, and prevent damage to the reputation of plastics.

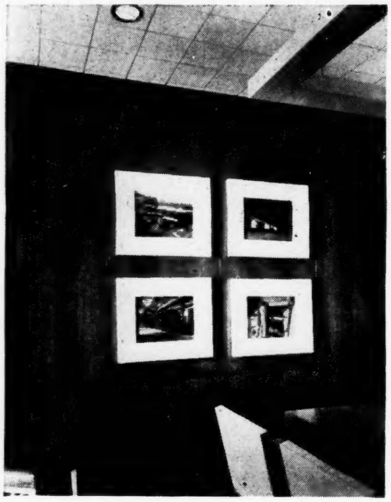
Through its resin adhesive division the PMMA cooperates with trade and technical groups in the plywood industry, notably the Forest Products Laboratory and the Douglas Fir Plywood Association, to promote sound growth of this major field for plastic materials. The resin adhesives group maintains an active technical committee dealing with specifications and uses of synthetic resin adhesives.

Cooperation with the SPI and the Society of Plastics Engineers in problems where the broad interests of the industry are involved. A PMMA committee is now working with the executive groups of SPI and SPE to find an equitable permanent plan for joint effort.

1946 Hyatt Award

THE John Wesley Hyatt Award for the advancement of plastics will be presented on April 23 in the Hotel Statler, Detroit, Mich., according to an announcement by William T. Cruse, secretary of the award committee. The number of entries received before the nominations closing date of March 3 is larger this year than for any previous year, Mr. Cruse stated. The award committee met in New York last month to select the 1946 winner.

Sponsored by Hercules Powder Co., the award is presented annually to the entrant judged to have made a significant contribution to the plastics industry during the previous year and consists of a gold medal and a $1,000 cash prize. All of the award committee members are prominent in the fields of art and science and include Richard F. Bach, dean of education and extension of the Metropolitan Museum of Art; Neil O. Broderson, president of the Society of the Plastics Industry, Inc.; W. Albert Noyes, Jr., president of the American Chemical Society; Charles F. Kettering, vice president of General Motors Corp.; Edward R. Weidlein, director of the Mellon Institute of Industrial Research; and Gerald Wendt, editorial director of *Science Illustrated*. Also on the committee are last year's winners, Virgil E. Meharg, development superintendent of Bakelite Corp., and Paul D. Zottu, consulting electronic engineer, who received the award for their simultaneous work in the electronic heating of themosetting plastic materials.



View of One of Bakelite Corp.'s Redesigned Offices Showing Wall Panels of Laminated Plastic with Wood Surface Veneer, Bakelite Resin Table Top, and Vinylite Resin-Coated Fabric Upholstery

Plastics for Offices

BAKELITE CORP., New York, N. Y., has remodeled the interiors of its sales engineering and executive offices to demonstrate the utility and beauty that may be obtained when plastic materials are correctly applied. Throughout these new offices, Bakelite and Vinylite plastics appear as decorative laminates in combination with wood veneer surfacing, as resin-bonded plywood, molded floor tiles, extruded stripping, flexible film and sheeting, resin-fortified wood lacquers, and resin-coated fabrics. The offices were constructed from original designs by Walter D. Teague and show the combination of unusually high eye appeal and practical serviceability which are provided by the plastics for interior remodernization.

In these redecorated office, display, and reception rooms, Bakelite laminated plastics are used to provide durable, attractive, cigarette-proof table, desk, and counter tops and radiator cabinets. Wall paneling is either of laminated plastics with surfacing veneers of wood, or of resin-bonded plywood with wood surfaces. These resin-wood combinations are also used for door surfaces, bookcases, desk bases, and other office furniture. Wainscoting is of Vinylite resin-coated cloth and resin-bonded plywood coated with a Bakelite resin varnish. All draperies are of Vinylite film, with special combinations of translucent and opaque films used to give an iridescent effect. Vinylite resin-coated fabric is used for all upholstery, and Vinylite tiles in contrasting colors form the flooring. Baseboard trims are of extruded Vinylite plastics in contrasting colors.

Ohio SPE Group Meeting

THE Central Ohio Section of the Society of Plastics Engineers held its monthly meeting on February 21 at the Zane Hotel, Zanesville. Principal speaker was W. H. Aiken, assistant manager of plastics department, Goodyear Tire & Rubber Co., whose subject was "Plastic Films."

Monsanto to Produce Polvin

THE board of directors of Monsanto Chemical Co., St. Louis, Mo., approved a company project which would launch Monsanto into commercial production of polyvinyl chloride plastic on a major scale. The project, which follows more than three years of extensive pilot-plant production, involves construction of manufacturing facilities at the company's plastics division, Springfield, Mass. The decision to produce these plastics places the company in a position to supply a complete line of plastics for all major uses.

The plastic will be marketed under the trade name of Polvin, and it will be produced in the form of elastic films and sheets, as colored and transparent rigid sheets, as extrusion compounds, molding compounds, and calender compounds, and as polyvinyl chloride-base resins. Polvin, it is claimed, is resistant to alkalies and acids, has low water absorption, good insulating properties, and is extremely flexible, easily machined, and transparent and colorfast. End-uses for Polvin elastic film and sheeting include shower curtains, aprons, utility garments, rainwear, draperies, upholstery, handbags, and shoe uppers. In rigid sheets, the material is used for making precision instruments, protective covers for charts and blueprints, for aircraft windshields and glazing and for binding books. As extrusion compounds, it is used for wire and cable insulation. Polvin is also used for injection molding of auto parts and for compression molding of high-fidelity sound records.

The College of Engineering of the University of Illinois and Monsanto's plastics division have announced renewal for the third year of a contract wherein Monsanto provides funds for a fundamental research program on the dynamic fatigue characteristics of plastics. The research conducted under Prof. William N. Findley, of the department of theoretical and applied mechanics, is intended to provide a better knowledge of the behavior of plastic materials under cyclic stresses and to aid in choosing the best test methods for use in studying the fatigue properties of these important materials.

The use of plastics as structural materials reached large proportions during the war and is increasing at a rapid rate for important peacetime applications in automobiles, aircraft, domestic equipment, and other products. A better knowledge of fatigue properties is essential if plastics are to be used intelligently in such engineering design. Professor Findley's researches, part of which have been sponsored by Monsanto, have made significant contributions along these lines, and further data of importance are expected to result from the work now under way.

Expands Plastics Program

EARL BUNTING president of O'Sullivan Rubber Corp., Winchester, Va., announced at the directors' meeting of March 21, James N. Mason, vice president in charge of manufacturing was elected executive vice president of the company. His new duties will include the overall supervision of sales, development, and manufacturing in the plastics operations of the company.

In making this announcement Mr. Bunting stated, "This action of the board was brought about by the increased responsibility Mr. Mason has assumed by reason of the enlarged manufacturing facilities for making soles and heels and the development and expansion of our plastics program."

Mr. Mason came to O'Sullivan in August, 1941, as superintendent of the plant and became general plant manager in 1942. Then in 1944 he was elected vice-president in charge of manufacturing. In this capacity Mr. Mason has been directly responsible for O'Sullivan's entry into the plastics field and the development of its plastics program. The new plastics division of O'Sullivan Rubber is being designed and equipped to serve large industrial users of calendered thermoplastic products with a wide range of resin formulations for specific end uses.

Mr. Mason, son of Herbert T. Mason,

View of Redesigned Bakelite Corp. Display Room Showing Vinylite Draperies, Floor Tiling, Resin Coated Fabric Upholstery, and Baseboard Trim, and Laminated Bakelite with Wood Veneered Paneling

president of the Quabaug Rubber Co., North Brookfield, Mass., was born on May 28, 1911, in Brockton, Mass. He is married and has three sons.

James N. Mason

Pyroxylin-Coated Fabrics and Paper

THE following are the figures for pyroxylin-coated fabrics and paper for the last quarter of 1946 and for the yearly totals, as reported by the Bureau of the Census, United States Department of Commerce. The statistics are based on reports from 27 companies (28 for the first five months of 1946) and represent the operations of processors who coat or impregnate fabrics or paper with soluble cotton or pyroxylin preparations, either separately or in combination with other materials. "Light" cotton fabrics include sheetings and print cloths; "heavy" cotton fabrics include drills, ducks, sateens, broken twills, and moleskins. All figures are given in linear yards, except for pyroxylin spread and monthly capacity, given in pounds.

	October	November	December	Total for 1946
Total (except Non-Fabric materials):*				
Shipments	9,866,873	9,216,634	9,135,070	99,581,850
Unfilled orders†	12,913,870	12,354,069	13,194,332	——
Light cotton fabrics:				
Shipments	4,858,787	4,835,745	4,869,687	48,335,658
Unfilled orders†	5,928,473	5,636,975	6,418,428	——
Heavy cotton fabrics:				
Shipments	2,729,797	2,284,739	2,321,347	27,553,781
Unfilled orders†	4,858,853	4,477,055	4,735,381	——
Custom coatings:‡				
Shipments	2,278,389	2,096,150	1,994,036	23,692,411
Unfilled orders†	2,126,544	2,240,039	2,040,523	——
Non-fabric materials:				
Shipments	442,606	320,928	389,317	4,762,155
Unfilled orders†	844,614	720,278	572,493	——
Pyroxylin actually spread, lbs.	7,479,845	7,205,095	7,058,025	79,209,456
Monthly capacity§, lbs.	16,722,847	16,722,847		——

* Data include an undetermined quantity of custom coating of non-fabric materials.
† Orders on hand at the close of the month, exclusive of contracts, with shipping dates unspecified
‡ Data for fabrics other than cotton are included with custom coating to avoid disclosing data for individual establishments.
§ Based on all machines suitable for pyroxylin coating, assuming 600 working hours per month of entire production on 53"-1.32 sateen coated to a finished weight of 17.5 oz./linear yd., assuming 40% solids.

Utilizes Farm By-Products

DEVELOPMENT of a chemical process to use agricultural by-products as corncobs, cottonseed hulls, and hulls or bran of oats and rice in making nylon was disclosed by E. I. du Pont de Nemours & Co., Inc., at a meeting of the National Farm Chemurgic Council. The cobs, hulls, and other cellulosic materials are sources of furfural, and the process turns furfural into adiponitrile, important to making nylon. A unit will be built at du Pont's electrochemical department's plant, Niagara Falls, N. Y., to produce adiponitrile from furfural. Oliver W. Cass, who headed the research team on the project at Niagara Falls, said this work, from the first laboratory experiment to the large semi-works units, cost the company about 12 years and $1,000,000. Du Pont has contracted with Quaker Oats Co. to supply furfural as soon as the new adiponitrile unit starts.

In making furfural, the hulls or cobs are pressure-cooked with a weak acid, then purified. Next comes complicated processing including reactions of furfural with steam, gases, and other chemicals, resulting in adiponitrile. This is further processed into hexamethylene diamine in a du Pont plant at Belle, W. Va., and then reacted with adipic acid to produce hexamethylene diammonium adipate, commonly called nylon "salt." To facilitate handling, this is dissolved in water and shipped by tank car to the nylon flake and yarn plants at Seaford, Del., and Martinsville, Va., for final processing.

Shipments and Consumption of Plastics and Resins

THE following statistics represent the shipments and consumption, in pounds, of plastics and synthetic resins for the last quarter of 1946, as reported to the Bureau of the Census, by manufacturing companies and company departments. For October and November, 78 such companies and departments reported. In December, two additional companies reported; while one company discontinued operations. Data for synthetic resins for protective coatings are not included.

More Polyethylene Coming

POLYETHYLENE has become so important commercially that Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y., plans to double its wartime production of polyethylenes at its South Charleston, W. Va., plant. Present production is already more than six times the original rated capacity and is far from sufficient to meet the demands of industry upon Bakelite Corp., 300 Madison Ave., New York 17, which markets this plastic. New plant construction, which will be completed early next year, will double the present large output. According to H. S. Bunn, Bakelite vice president, the use of polyethylene resins has spread to applications never dreamed of in the early stages of their development. From the initial wartime use in insulating coaxial radar cables, polyethylene resins are used in extruded form for food bags; in monofilament and tape forms for interior decorating, upholstery, and clothing accessories; in molded form in a wide variety of products including food bowls, tumblers, and ice cube trays; and in coatings or cast films for packaging of food and for closures and liners.

	October	November	December
Cellulose acetate and mixed ester plastics*	9,449,173	7,056,995	9,642,223
Nitrocellulose plastics*	1,697,267	1,223,421	1,506,436
Other cellulose plastics†	1,233,864	809,883	922,608
Phenolic and other tar acid resins:			
Laminating (dry basis)	2,239,256	1,957,020	3,120,980
Adhesives (dry basis)	1,625,671	1,389,064	1,614,113
Molding materials*	9,686,188	8,770,827	**10,579,844
All other (dry basis)‡	4,622,775	4,585,620	**5,185,017
	18,173,890	16,702,531	20,499,954
Urea and melamine resins:			
Adhesives (dry basis)	4,519,163	3,869,496	3,911,380
Textile and paper treating (dry basis)	1,410,452	1,357,622	976,008
All other, including laminating (dry basis)‡§	351,267	829,377	880,226
	6,280,882	6,056,495	5,768,104
Polystyrene¶	9,166,486	7,215,827	**8,091,951
Vinyl resins:			
Sheeting and film*	1,428,504	892,822	1,828,122
Textile and paper coating (resin content)	3,068,559	3,660,056	2,874,370
Molding and extrusion (resin content)	5,348,469	5,693,090	6,243,440
All other, including adhesives (resin content)‡	3,098,444	3,209,380	3,260,779
	12,943,976	13,455,348	14,206,711
Miscellaneous plastics and resins*‡‖	8,780,812	8,289,012	7,418,368
TOTALS	67,726,350	60,819,512	68,056,355

*Includes fillers, plasticizers, and extenders.
†Includes methyl and ethyl cellulose and related plastics.
‡Excludes data for protective coating resins.
§Urea and melamine molding materials are included with miscellaneous molding materials.
¶Dry basis, including necessary coloring materials.
‖Includes data for urea, melamine, acrylic acid, and miscellaneous molding materials, petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials.
**Includes operations for two companies not previously reporting and deletes one company which discontinued operations.

RUBBER WORLD
NEWS of the MONTH

Highlights—

Hearings on short-term legislation on rubber were concluded during March, and the Crawford Bill reached the House and the Senate where it was passed on March 17 by the House and on March 24 by the Senate. The bill was signed on March 29 by President Truman, and thus the first postwar legislation on rubber on a national basis became law. There are some indications that long-term legislation on rubber might also be passed by the present session of Congress. Some suggestions for this type of legislation were made by R. P. Dinsmore, vice president, Goodyear Tire & Rubber Co., in a talk at Toledo, O. on March 14. The outlook for the rubber goods manufacturing industry for 1947 was considered promising in statements by company executives. New information on the production, export, and stocks of rubber in the Far East was provided by the United States Department of Commerce, together with pertinent comment regarding trends and future developments in this area. The U. S. Maritime Commision ship, *Martin Behrman*, was seized by the Dutch in the N. E. I., and comments *pro* and *con* in connection with this incident were made public.

Private Importation of Natural Rubber Now Possible; Industry Outlook for 1947 Improves

With the passage of the Crawford Bill by the House and the Senate and with the signature of President Truman on March 29, the exclusive purchase of natural rubber by the United States Government was discontinued on April 1. In addition a statement of policy regarding the intention of this country to preserve its synthetic rubber industry was a part of this legislation. It is also quite likely that long-term legislation on rubber may be considered by this session of Congress and the matter cleared up in most aspects by July 1, 1947. Consequently, the outlook for the rubber goods manufacturing industry is more promising, not only for 1947, but for the next few years. Statements to this effect were made by H. E. Humphreys, Jr., of United States Rubber Co., and by J. J. Newman for The B. F. Goodrich Co.

R. P. Dinsmore, Goodyear Tire & Rubber Co., urged an immediate consideration by industry, the public, and the government of the three major factors essential to a long-range synthetic rubber program, i.e., the amount used, the method of assuring production, and the method of assuring consumption.

Extensive statistics on rubber production and consumption both in this country and abroad and important factors affecting future developments have been reported by agencies of the U. S. Government, the Rubber Manufacturers Association, Inc., and by "Lockwood's March Rubber Report."

Congress Passes Crawford Bill

The House of Representatives Armed Services Subcommittee concluded its hearings on the Arends and Crawford bills on February 27 and then recommended the latter bill for passage. The Senate Banking & Currency Subcommittee held hearings beginning March 11 and also approved the bill, as recommended by the House subcommittee, with minor wording changes. The Crawford Bill, which discontinues the government acting as the sole purchaser and importer of natural rubber after March 31, 1947, was debated on the floor of the House on March 17 and passed as written. The Senate debated the bill on March 24; then passed it with certain amendments on the same day and forwarded it to President Truman for his signature. The President signed the bill on March 29 and this legislation became law.

Many industry and government leaders testified before the two Congressional committees, some for and some against the passage of the Crawford Bill. A portion of the testimony of W. S. Richardson, president of the B. F. Goodrich Chemical Co., Robert S. Wilson, Goodyear vice president, and Thomas Robins, Jr., president, Hewitt-Robins, Inc., was presented in our February issue. The statements of other executives will be now recorded, in part.

Harvey S. Firestone, Jr., president, Firestone Tire & Rubber Co., again emphasized that our synthetic rubber industry was the best paid-up insurance policy which this country ever had. It has always been a fundamental policy of the Firestone Company to oppose any restriction through cartels or otherwise of the supply of rubber and other basic commodities, Mr. Firestone said. Such interference with the free flow of supply and demand produces artificial prices and is harmful eventually to both the producers and the consumer. International allocation was terminated on January 1, 1947, and was followed by the reestablishment of a free market for natural rubber outside the United States. These world developments, coupled with the continued operation of our synthetic rubber facilities, indicate a reasonable balance between supply and demand in rubber. Under these circumstances Mr. Firestone urges that the United States return to the free enterprise system in rubber procurement by reestablishing private buying immediately. In fact, a continuation of exclusive government purchase of rubber might be construed as a buyer's cartel and place the United States in a very inconsistent position to oppose any future scheme artificially to control price through the restriction of the production of natural rubber on the part of the producers, Mr. Firestone added.

Rep. Carl Vinson, of Georgia, in questioning Mr. Firestone, obtained from him the comment that he did not think it was sound for the government to do all the buying of rubber used by the industry in the United States, and that it was also not sound, eventually, for the government to operate the synthetic rubber plants. Representative Vinson then argued that if the government continued to buy all the rubber used, it should also go ahead and produce all of the rubber used by the industry in this country.

Further questioning revealed that Mr. Firestone felt that Congress should decide the minimum amount of synthetic rubber that should be used by the industry and that legislation should be passed to make it mandatory upon every tire manufacturer to use in every tire some minimum, to be established, of synthetic rubber.

William L. Batt, former chairman of the Inter-Agency Policy Committee on Rubber, in his testimony warned the House subcommittee that some of the questions to be answered in connection with the formulation of a long-range policy on rubber would be most difficult. Mr. Batt supported the Crawford Bill and emphasized the need of a declaration of Congressional policy on synthetic rubber so as to provide some confidence to possible future purchasers of the synthetic plants.

George M. Tisdale, vice president, U. S. Rubber, stated that he felt public procurement through at least September 30, 1947, was essential and inseparable from specification control to insure equitable distribution of natural rubber. The United States Rubber Co., believes, just as others in the industry, in the operations of private enterprise, but we also know that we are forced to purchase rubber from what are essentially controlled makets, even though we are opposed to such artificial forms of business operation, Mr. Tisdale said. Questioned regarding the future possibility that the Dutch and the British would perhaps try to regulate the price and influence the production of rubber, Mr. Tisdale agreed that such a possibility did exist. Reference was made to the discussion of this type of situation by the proposed International Trade Organization. A definite policy position on synthetic and natural rubber by the United States was considered to have a bearing on the trend of future discussions by any international trade organization.

Harry P. Schrank, vice president Seiberling Rubber Co., supported the Arends Bill for continuing public procurement. Mr. Schrank emphasized the fact that the same group of men whose advice was long and consistently sought by government agencies having rubber problems during the war, are now recommending temporary continuation of controls, and this point in itself, was evidence of the extreme necessity of those controls.

John C. Houston, Jr., Commissioner of Civilian Production in the Office of Temporary Controls, presented a detailed report on the rubber situation to the subcommittee. In this report it was pointed out that with the termination of international allocation control at the end of 1946, the principal rubber producing areas took steps toward freeing the world rubber market and abandoned the govenment-to-government procurement negotiations by which the United States contracted for eastern rubber during 1946. In line with this change, and on the basis of supply considerations, the OPA proposed to eliminate the R-1 provision for exclusive public importation of natural rubber and to permit a return to private purchase as of January 1, 1947. The rubber manufacturing industry, represented through the CPA Industry Advisory Committee vigorously opposed the restoration of private purchase as opening the way for inflationary pressures on the world price of natural rubber and other-

wise theatening the orderly reconversion program.

The OWMR and Mr. Steelman reviewed the problem, and on the basis of stabilization considerations directed the continuance of the exclusive public purchase program through January, 1947. This directive was subsequently extended to March 31, 1947. The CPA authorized public purchase up to 150,000 long tons of natural rubber during the first quarter of 1947, but procurement to date is far behind schedule and has resulted in a disproportionately low percentage of the better grades of rubber, including latex and pale crepe, which are in critically short world supply. The 20¼¢ base price offered by the United States has apparently tended to serve as a floor to the world price of rubber, and other countries have been able to divert supplies by offers of a fraction of a cent or so higher. The OWMR directive has recently been modified as regards flexibility of prices to be paid for latex and pale crepe, Mr. Houston's report stated.

It was emphasized that continuation of public procurement of natural rubber in view of performance during the first two months of 1947 might well result in depleting our stockpile far below a limit considered safe for strategic reasons. While some rise in the price of natural rubber undoubtedly could follow the discontinuance of public procurement, Mr. Houston said he believed it would be of very short duration, particularly if specification controls are continued in this country in order to limit our demand on the natural rubber market and to indicate to the rest of the world that we are determined to preserve our synthetic rubber industry.

It was explained that the CPA will continue to permit relaxations of the controls in R-1 with regard to the permitted use of natural rubber but that this agency cannot go too far along the lines of relaxation without running into the problem of maintaining our synthetic rubber industry. Mr. Houston said that a decision will have to be made some time in the not too far distant future on what the desirable level of operation of that industry is. Although it is not necessary for that level to be decided in connection with the temporary legislation being formulated, Mr. Houston thought it was one of the points which should be determined in connection with the permanent legislation as rapidly as it is possible to do so.

W. J. Sears, director, CPA Rubber Division, explained in some detail the working of rubber controls with regard to specifications, allocations, and inventory controls. An increase from a 60-to-90-day inventory of natural rubber was recommended by Mr. Sears if private purchase of natural rubber became possible after March 31. Mr. Sears himself favored the continuation of the public purchase program beyond March 31, but pointed out that this opinion was his personal one and not the opinion of the agency he represented. A list of 45 companies that account for 93.2% of the total natural rubber consumption at present was given the subcommittee. It was pointed out that with the private purchase of natural rubber it would be impossible for the CPA to allocate stocks other than those of the Office of Rubber Reserve and more difficult for the CPA to keep a record of new supply. Specification and inventory control would remain as the major means of attempting to maintain equitable distribution throughout the industry.

R. D. Young, president, Rubber Trade Association of New York, Inc., presented a prepared statement to the subcommittee in which he supported the Crawford Bill. The contents of this statement were similar to those reported in our February issue. Mr. Young revealed that since July 1, 1946, the quantity of rubber which Rubber Development Corp. planned to purchase was allocated between natural rubber importers and the manufacturers of rubber goods on the basis of 70% and 30%; the importers then purchased the rubber from Far Eastern shippers, sold it to Rubber Development, and received a commission for making the sale.

Alan Grant, vice president, Charles T. Wilson Co., and former president of the Rubber Development Corp., also strongly supported the Crawford Bill. Mr. Grant in his statement emphasized repeatedly that since November, 1946, he had urged the return to private purchase of natural rubber. He provided figures to show that since July, 1946, through January, 1947, the percentage of No. 1 and No. 2 ribbed smoked sheets obtainable under public procurement had dropped from 40 to 10% of the total and that the percentage of remilled grades had increased from 25 to 70%. It is obvious from these figures that the rest of the world is filling its requirements with the higher grades of rubber, while the United States must be satisfied with that which remains, it was stated. It would seem, therefore, that the present method of procurement is ineffectual and that under it the United States is not receiving its proper share of new production or its proper distribution of grades.

H. M. Royce, Boston Woven Hose & Rubber Co., supported the Arends Bill and said that his company felt that public buying should be continued for another six months inasmuch as public buying and the allocation of rubber bought through public buying could best be distributed to small manufacturers of rubber goods under such a set-up.

In a letter to the House subcommittee, February 28, Mr. Sears provided some figures to show that estimated natural rubber consumption until June 30, 1947, based on present specifications for rubber products permitting approximately 42% of natural rubber to the total natural and synthetic consumption, would require additional importation of 17,300 long tons during the second quarter. Industry requirements to June 30, under revised specifications providing 60% natural rubber use after April 1, 1947, would require 117,900 tons additional arrivals during the second quarter. Additional rubber required through the third quarter on the 42% program totaled 99,000 tons and for the 60% program 233,300 tons. Mr. Sears made the point that if public purchase were continued until the 233,300 tons of natural rubber had been bought and that if it were received in this country by August 1, 1947, private purchase could most properly commence at that time.

In the debate in the House on March 17, only one member, Rep. Charles R. Clason of Massachusetts, argued against the Crawford Bill. It was passed on that day and sent to the Senate.

The Senate Banking & Currency Committee appointed a subcommittee on rubber which began hearings March 11. The bill proposed by Senator Bricker of Ohio, which would have extended public purchase of natural rubber, and a bill proposed by Senator Ives of New York, which would not extend public purchase, were considered. Testimony was given before this subcommittee by John L. Collyer, of B. F. Goodrich & Co., Paul W. Litchfield, Goodyear Tire, and J. P. Seiberling, Seiberling Rubber, in favor of the Bricker Bill. Acting Secretary of State Dean Acheson, CPA Commissioner John C. Houston; Alan Grant, and Thomas Robins, Jr., testified in favor of the Ives Bill. The subcommittee on March 21 reported favorably on the Ives Bill, and on March 24 it was passed by the Senate. Among the amendments added to the Senate version was one authorizing the War Assets Administration to dispose of the neoprene plant, styrene plants, the petroleum butadiene plant located at Toledo, O., two alcohol butadiene plants, and copolymer plants to the extent that the aggregate actual capacity of such copolymer plants shall not be less than 600,000 long tons a year.

Pertinent features of the bill as passed by Congress include the following; "Natural rubber, when stockpiled and held in storage, must be rotated and replaced from time to time by equivalent quantities of fresh material. By reason of the foregoing, a program with respect to rubber must be devised which will supplement that heretofore adopted in the Strategic and Critical Materials Stockpiling Act.

"It is the policy of the United States that there shall be maintained at all times in the interest of national security and common defense, in addition to stockpiles of natural rubber which are to be acquired, rotated, and retained pursuant to the Strategic and Critical Materials Stockpiling Act (Public Law 520, Seventy-ninth Congress, approved July 23, 1946), a technologically advanced and rapidly expandible domestic rubber-producing industry and sufficient productive capacity to assure the availability in times of national emergency of adequate supplies of domestically produced rubber to meet the industrial, military, and naval needs of the country.

"It is necessary in the public interest and to promote the national defense (1) that Congress make a thorough study and investigation of means of accomplishing such policy through the enactment of permanent legislation, the study and investigation to be completed within such time as will permit the legislation to be enacted, if possible, during the first session of the Eightieth Congress; and (2) that, pending the enactment of such permanent legislation, the United States continue to allocate natural rubber and natural rubber products, and the authority of the United States to manufacture and sell synthetic rubber to temporarily continued.

"Notwithstanding the provisions of Title XV of the Second War Powers Act, 1942, as amended, Title III of such act and the amendments to existing law made by such Title, shall remain in force until the effective date of permanent legislation enacted to accomplish the policy set forth above, but in no event beyond March 31, 1948, insofar as such provisions authorize allocations of natural rubber and synthetic rubber and natural and synthetic rubber products. (including import control of synthetic rubber and natural and synthetic rubber products but excluding import control of natural rubber), and it is hereby directed that to the extent necessary to accomplish the purpose of this joint resolution the powers, functions, duties, and authority under the provision so continued shall be exercised and performed until that date."

The phrase, "including the conduct of research essential to the development of the synthetic rubber industry," was inserted in connection with the authority of the U. S. to manufacture and sell synthetic rubber.

Crude rubber futures trading, in suspension since February 6, 1942, because of the war emergency, will be resumed on Commodity Exchange, Inc., 81 Broad St., New York 4, Thursday, May 1, 1947, the Exchange's board of governors

LD

ous-
Jr.,
sub-
ably
was
end-
one
tion
ene
lo-
ene
cent
uch
han

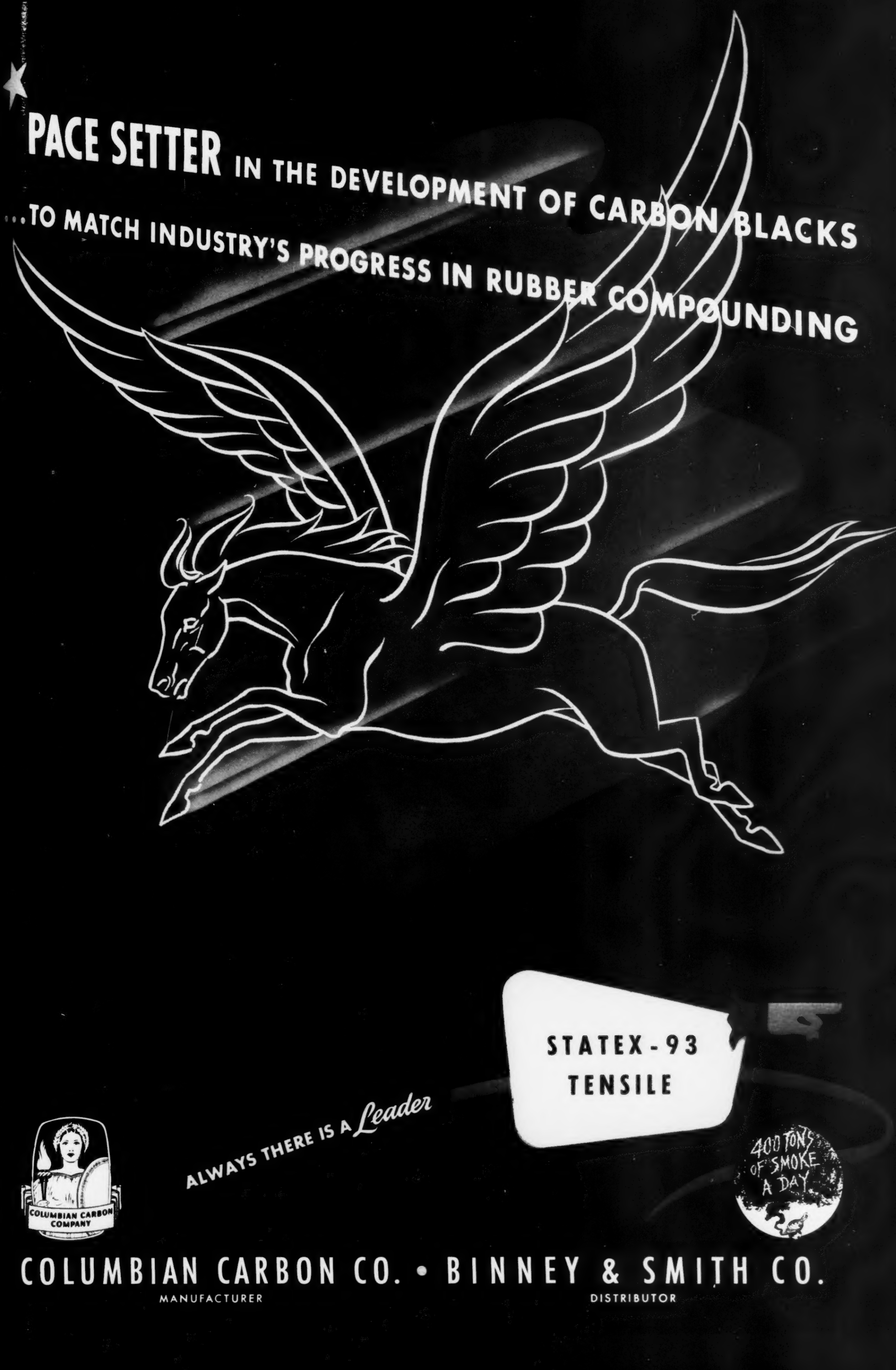
sed
Wat-
in
om
of
ng,
be
eto-
ical

ates
mes
om-
of
red,
ra-
ing
on-
no-
ble
and
the
ncy
ro-
ili-

and
hat
in-
uch
ent
to
er-
ble,
eth
act-
the
ral
and
an-
m-

tle
42,
the
uch
ec-
ted
ve,
in-
ca-
ub-
ro-
en-
ub-
rol
ed
sh
he
n-
be
e."
re-
he
in
S.

n-
he
n-
t.,
37,
rs


PACE SETTER IN THE DEVELOPMENT OF CARBON BLACKS
...TO MATCH INDUSTRY'S PROGRESS IN RUBBER COMPOUNDING
STATEX-93
TENSILE
ALWAYS THERE IS A Leader
COLUMBIAN CARBON COMPANY
400 TONS OF SMOKE A DAY
COLUMBIAN CARBON CO. • BINNEY & SMITH CO.
MANUFACTURER
DISTRIBUTOR

announced on April 1. Rubber was restored to private industry through adoption by Congress last month of the Crawford Bill.

The trading unit, an Exchange official said, would be ten long tons, as it was before the war, with delivery at New York, N. Y., of four tenderable grades, of which No. 1 ribbed smoked sheets will be basic, No. 1X ribbed smoked sheets at five points premium, No. 2 at 50 points discount, and No. 3 at 100 points discount.

First delivery month, at the reopening, the governors decided, will be September, 1947, followed by each succeeding month up to and including July, 1948.

Other Comments on Rubber Situation

In "Lockwood's March 15 Rubber Report" attention was called to the fact that there is a growing realization that specification control, rather than quantitative allocations, as such, will go far toward solving the national security requirements of consumption control for the long pull. Reference was made to statements made by Mr. Collyer, of Goodrich, before the Senate subcommittee on rubber on March 11, in which in talking about the longer-range problem of protection to the synthetic rubber industry, this rubber company executive contended that the consumption control really required could be limited to specification control compelling the use of 100,000 tons of GR-S per annum in passenger-car tires. He stated that an additional 50,000 tons of special-purpose rubbers would be used voluntarily on their merits, and that he saw no need of compulsory use of GR-S in other rubber products or in larger amounts.

Also in this March 15 report, F. D. Ascoli, managing director, Dunlop Plantations, Ltd., and chairman, Rubber Growers Association, in an article on "Natural Latex Supplies" stated that he believed that the rubber producing industry has fully realized the possibilities of shipment in the form of latex and that the industry can be organized without much difficulty to meet total world requirements. On the other hand the great shortage of first latex crepe and sole crepe is creating an alternative incentive in view of the very high premia at present attached to those grades, and it is possible that this condition might react to some extent against the future production of latex.

J. G. Loeber, writing from Amsterdam, Holland, in this same report, stated that gradually the political situation in the Netherlands India is crystallizing into a somewhat clearer picture and many political leaders of the Indonesian Republic are showing a willingness to cooperate with the Dutch. Commenting on the export restrictions of the Dutch Government, it was pointed out that the official attitude was that most were from those ports nominally, but not actually under the control of the republic. Illegal exports were considered as those goods not sold by the real owners, but by non-proprietary occupants. Such exports were usually sold at prices far below cost, and the real worth of the corresponding imports was only a quarter of the exports, thus leading to impoverishment of the country.

Rehabilitation of the rubber plantation industry should not involve very high initial costs since if the processing plants have been destroyed, simple smoked sheet installations may be erected at comparatively low cost, Mr. Loeber said. However, for the production of concentrated liquid latex the capital cost of a latex plant, together with shipping facilities, is high. Before latex plants can be erected, political stability will have to be such that capital investment above the barest minimum in Indonesia is justified, and adequate foreign credit will have to be obtained. Mr. Loeber indicated that he felt that if private enterprise was left to look after itself, it would be more successful in attracting foreign credit for rehabilitation, but that since the Dutch Government had chosen public loans and planned distribution of credit, it would not be an easy matter to alter this course.

H. T. Karsten, London correspondent for Lockwood's report, mentioned that the London rubber market at the end of February was static with prices for standard ribbed smoked sheets for March/April delivery ranging from 20.2 to 20.4¢ a pound, f.o.b. Malayan ports. Early in March, purchases by Russia at a rate of 10,000 tons a month were confirmed, but the price was not stated. Inquiries for substantial purchases from the Argentine and from Switzerland were also reported. January exports of rubber from Malaya totaled 67,500 tons, with 19,600 tons shipped to the United Kingdom, 17,700 tons to the United States, and the remainder going to other countries.

Rene Fabre, Lockwood's Paris correspondent, reported that the French rubber industry has made remarkable progress since the liberation. Production of rubber goods increased from 710 tons in January, 1945, to 3,654 tons in January, 1946, and 5,430 tons in November, 1946. It is hoped that the average rate of production in 1947 will reach 6,500 tons per month. Demand is still unsatisfied, however, and the further increase in production necessary to improve the situation is not possible because the factories have now reached their maximum productive capacity. Without new factories and new equipment it will take a long time to satisfy the domestic market in France.

Dinsmore on Rubber Policy

Dr. Dinsmore in a talk before a regional meeting of the American Chemical Society in Toledo, O., March 14, outlined tentative starting points for the formulation of a permanent rubber program which is intended to preserve the interests of the United States.

"We need then a recognition of the fact that for this country rubber is a vital material in war or peace, and that its supply can be left neither to the mercy of our enemies nor to the commercial whims of our friends. It must be available at once in time of war. It must be used continuously, and constantly improved in time of peace. These considerations are paramount. They should dwarf all other related matters of public policy or private enterprise," Dr. Dinsmore said.

We must have a concrete program to accomplish this result, but just now the formulation of such a program is in the doldrums, he added. It is, perhaps, natural that with so many factors remaining uncertain, no single definite program has been suggested, and it is possible also that a final program must necessarily await the clarification of some of these factors, as for example, the character of the temporary legislation which should soon be passed.

Three major factors essential to a long-range synthetic rubber program: namely, the amount used, the method of assuring production, and the method of assuring consumption, were discussed. Because of large changes frequently experienced in our rubber consumption, it would appear better to consider the use of a certain percentage of the total rubber as synthetic, rather than a fixed amount, it was said. Leading technical men in the industry favor setting this figure at about 20%.

With regard to the method of assuring production, it is believed that the uncertainties of the situation will continue to be so great that it will be difficult to sell the basic plants which must be used to produce rubber. We need a low-cost GR-S not unduly burdened with plant amortization charges. Hence these basic plants might well be written down to a low figure whether for lease or sale to industry, or for cost computation under government operation. Dr. Dinsmore suggested that the only two feasible methods for assuring production seem to be government operation and lease to private companies for their operation. If private leasing is adopted, the government might require the right to recapture the plant if the agreed proportion of GR-S is not produced.

Possible methods of assuring consumption mentioned were: (1) continued specification of minimum use of GR-S according to product; (2) the plan of issuing a certificate with each purchase of GR-S which would permit the purchase and the import of a fixed ratio of natural rubber; (3) statutory provision that the industry must use a certain percentage of GR-S, (this probably would have to be allocated differently to the various divisions of the industry); (4) turning the industry over to private hands and relying upon competition to keep it alive to the desired extent.

The selection of the best method of assuring consumption is one of the more difficult problems, and it requires foresight and forbearance because it reaches into the present private operations of industry, Dr. Dinsmore explained. Any of the first three methods might be satisfactory, but even though the free enterprise method may ultimately be applied with safety, its application should be preceded by more definite control.

Except for contract amounts, the surplus styrene capacity is rapidly going into lines other than rubber. Similarly, diversion might be expected in the case of butadiene plants and ultimately in the copolymer plants also. If we do not have a definite program which contemplates the entire field, we may be in danger of losing our synthetic rubber capacity by natural attrition, the speaker warned.

This synthetic rubber industry was put together under great stress by the cooperation of a number of industries, and with a large expenditure of the taxpayer's money. It would be extremely unfortunate, and perhaps disastrous, if this industry were not preserved for our American economy and military defense until it has been demonstrated that we no longer need it, Dr. Dinsmore concluded.

The "Martin Behrman" Incident

The American Liberty ship, *Martin Behrman*, owned by United States Maritime Commission and chartered by the Isbrandtsten Co., New York, N. Y., while loading a cargo of rubber, sugar, chinchona, sisal, etc., at the Netherlands India port of Cheribon, during February, was seized by the Dutch Government; a prize crew was placed on board, and the ship was escorted to Batavia by a Dutch destroyer. The vessel arrived in Batavia on March 2 and in the course of the next several days 1,300 tons of its cargo were unloaded by the Dutch authorities.

The Isbrandtsten company held a press conference in New York on March 19, at which Walter Isbrandtsten, spokesman for the company, outlined steps the company was taking, in the public interest and in its own interests, and disclosed certain background information with regard to the

incident. It was stated that the *Martin Behrman* had, at the request of the Indonesian Government authorities, with the sanction of the Dutch authorities in the United States, and with no objection from the U. S. State Department, sailed to Cheribon, to procure a cargo of rubber, sugar, sisal, and chinchona. Mr. Isbrandsten pointed out that the issue in this case transcends the interest of any one company and is important from the standpoint of our international policy toward other countries as well as our interest in shipping, international trade, and international law.

Jacobus F. Frank, of New York, a rubber broker, who was born in Holland, but is now an American citizen, in a statement on March 21, said that he had noticed with growing misgivings the many articles which have appeared in the press of this country with regard to the *Martin Behrman*. In presenting further facts relating to this incident, Mr. Frank stated that the Isbrandsten Co. had been given permission to load a cargo at Cheribon provided no property of absentee owners, whether Dutch, British, French, Chinese, or any other nationality other than Indonesian, was involved. It was emphasized that this policy was not new and was formulated long before the question in connection with the *Martin Behrman* arose. Despite this clear and distinct information, a cargo, the bulk of which consisted of rubber produced on British estates and some rubber originating from estates owned by the Dutch and Chinese, was loaded on the *Martin Behrman*, Mr. Frank said.

It is the duty of the N. E. I. authorities to protect the absentee owners and to prevent products illlegally acquired from being exported from the N. E. I. unless the proceeds are secured by the N. E. I. Government for the original owners, it was stated further. The whole matter as he sees it is one for the courts, Mr. Frank concluded. If Mr. Isbrandsten feels that his rights have been violated, he should look to the courts for redress. If the U. S. Government wants to interfere, there is the International Court of Arbitration to decide the issue.

Industry Production Outlook

In a talk last month before the Advertising Club of Cleveland, O., during March, James J. Newman reported that America's postwar appetite for automobile tires has gobbled up virtually all the output of the industry since V-J Day and has kept production nearly a third higher than in prewar years. A total of 88 million tires was manufactured in 1946, and in 1947 it is expected that 89 million will be made. Passenger-car tires accounted for 66,300,000 of the 1946 total, and of these, 54 million went into replacement use. Mr. Newman said that his company's studies indicate that public buying of tires is assuming more normal patterns with respect to seasonal variation, but that business should still be excellent in all phases of the rubber industry — including tire retailing — throughout 1947.

Harry E. Humphreys, Jr., told the Association of Customers' Brokers in New York during March that the present high demand for passenger-car tires will hold through the early 1950's. The tire manufacturers this year will turn out 60.3 million passenger-car tires, as compared with 66.3 million in 1946. By 1948, demand for passenger-car tires will be 63.8 million, demand in 1949 and 1950 should average about 60 million, and in the early 1950's the tire industry should exceed its 1948 sales. Demand for replacement passenger-car tires will be about 40 million this year, Mr. Humphreys said. He expects some decline in replacement demand next year, but in 1949 replacement requirements will again increase as the automobile industry gets into high gear, he added.

Supplies of rubber sundries will be more plentiful this year than last, even though 1946 produced record-breaking sales of hot water bottles, ice bags, and similar merchandise, Clyde Delong, merchandise manager of Goodrich's industrial products division, predicted at a meeting of the Associated Chain Drug Stores—H. S. Benedikt Co., in New York late in March. He said that no great increase in the use of natural rubber for sundries is foreseen except for a few specific products. With the present ratio of about two parts of natural to one part of synthetic rubber, the quality of present-day products is as good or better than prewar.

In its March 7 issue of *Industry Surveys* on "Tires and Rubber," Standard & Poor's Corp., New York, took the position that unit tire shipments this year would not fall seriously below the 1946 record. Although a slackening of the replacement market demand was expected, original equipment sales should expand in line with estimated production of 5,000,000 cars and trucks, as compared with only 3,100,000 in 1946. A more severe drop in dollar sales is looked for because of the larger proportion of original equipment tire business, the reintroduction of lower priced lines, and the likelihood that some price weakness in the replacement field will develop once supply and demand come into balance. On the other hand, since non-tire activities should be up importantly, overall dollar sales close to the peacetime record set in 1946 are indicated.

The Rubber Manufacturers Association, Inc., reported a new high in monthly production of passenger-car tires when the industry produced 6,888,566 units during January, 1947. Truck and bus tire production for the same period was 1,619,377 units, and passenger, truck, and bus tube production was 8,719,462 units, also a new high for monthly production. The complete report, which covers only automotive equipment and does not include solid tires or pneumatic casings and tubes for motorcycle, bicycle, aviation, agricultural, or industrial equipment, appears below.

Consumption of rubber, both total and for most types, during January was therefore also high, with the following amounts used: natural, 45,372 long tons; GR-S, 46,311; neoprene, 3,815; Butyl, 6,802; and nitrile rubber, 439. The total amount of synthetic rubber used was 57,367 long tons, which together with the natural rubber consumed made a figure of 102,739 for both. Consumption of reclaimed rubber was 26,061 tons.

New supply and production of these rubbers during January, 1947, follow: natural, 102,080 long tons, (of which 1,226 were latex); GR-S, 51,575; neoprene, 3,400; Butyl, 6,580; and nitrile rubber, 510.

Stocks at the end of January were reported by the Rubber Division, CPA, as: natural, 294,147 long tons (including 5,299 tons of latex); GR-S, 84,459; neoprene, 10,470; Butyl, 19,253; and nitrile rubber, 3,498.

Department of Commerce Rubber Reports

A report from the United States Department of Commerce, Office of International Trade, by E. G. Holt, rubber adviser, stated that stocks of rubber in British Malaya on January 31 were 161,348 long tons, an increase of 12,637 tons above stocks on December 31, and of 22,417 tons above November 30. The exports from Malaya during December were 69,163 tons and during January, 67,504 tons; if stocks had remained at the November 30 level, the exports in these two months would have averaged over 79,000 tons monthly.

There has been a tendency for stocks to accumulate in the hands of up-country dealers in Malaya since October. The normal effect of such accumulations is that dealers, because of increased costs for warehousing and financing, pay lower prices for the rubber which they buy principally from small-holders. For January the increase in stocks was general for all groups.

MALAYAN STOCKS OF RUBBER
IN LONG TONS

	Oct.	Nov.	Dec.	Jan.
Estates	19,198	19,199	18,275	19,406
Up-country dealers	32,046	33,641	47,305	50,962
Dealers at ports	61,778	54,583	60,332	62,313
Port stocks	29,433	31,508	22,799	28,667
TOTALS	142,455	138,931	148,711	161,348

On the subject of the increase of purchases of rubber by countries other than the United States and the United Kingdom, it was stated that exports of rubber from British Malaya to such countries during the first ten months of 1946 were

ESTIMATED AUTOMOTIVE PNEUMATIC CASINGS AND TUBE SHIPMENTS,
PRODUCTION AND INVENTORY — JANUARY, 1947 — JANUARY AND DECEMBER, 1946

	Original Equipment	Replacement	Export	Total Shipments	% of Change From Preceding Month	Production During Month	% of Change From Preceding Month	Inventory End of Month	% of Change From Preceding Month
Passenger Casings									
Jan., 1947	1,421,694	4,529,227	108,723	6,059,644	—8.28	6,888,566	+12.90	2,477,226	+39.97
Dec., 1946	1,383,021	5,114,219	109,231	6,606,471		6,101,239		1,769,785	
Jan., 1946*	361,596	4,078,096	35,295	4,474,987		4,704,780		8,406,417	
Truck and Bus Casings									
Jan., 1947	500,322	834,877	103,905	1,439,104	—6.48	1,619,377	+14.31	850,963	+23.76
Dec., 1946	455,731	971,491	111,539	1,538,761		1,416,715		687,497	
Jan., 1946*	214,664	886,733	56,512	1,157,909		1,267,751		957,843	
Total Automotive Casings									
Jan., 1947	1,922,016	5,364,104	212,628	7,498,748	—7.94	8,507,943	+13.17	3,328,089	+35.44
Dec., 1946	1,838,752	6,085,710	220,770	8,145,232		7,517,954		2,457,282	
Jan., 1946*	576,260	4,964,829	91,807	5,632,896		5,972,531		3,364,260	
Passenger Truck and Bus Tubes									
Jan., 1947	1,921,588	5,085,235	180,858	7,187,681	—11.95	8,719,463	+15.49	5,075,406	+30.04
Dec., 1946	1,842,314	6,129,999	190,769	8,163,082		7,550,178		*3,903,019	
Jan., 1946*	571,176	3,629,637	80,939	4,281,752		4,668,297		3,953,850	

*Revised

41,581 long tons. Allocations by the Combined Rubber Committee were liberalized during the last quarter of the year, and the exports to this group of countries rose from 6,427 tons in November to 21,306 tons in December, to 30,113 tons in January, and to 36,654 tons in February, 1947.

The international allocation of natural rubber supplies ended December 31, 1946, and foreign countries have been buying to fill pipelines and establish necessary working stocks since the turn of the year. This buying includes purchases by dealers in the United Kingdom, where Malayan rubber can be imported at a lower price than it can be purchased from the British Government, which handled all the rubber imported there until December 31.

MALAYAN RUBBER EXPORTS
In Long Tons

	Oct.	Nov.	Dec.	Jan.	Feb.
United States	33,471	53,023	43,061	17,751	18,236
United Kingdom	35,209	20,200	4,796	19,640	14,687
Other countries	9,449	6,427	21,306	30,113	36,654
TOTALS	78,129	79,650	69,163	67,504	69,577

With regard to rubber export duties, from Indo-China exports of sheet and crepe rubber are subject to a duty of 0.46-piaster per kilogram; lower qualities and concentrated latex, 0.27-piaster per kilogram; and liquid latex 0.18-piaster per kilogram. From the Netherlands India, an export duty of 20 guilder cents per kilogram is charged, according to information given at the November, 1946, meeting of the Rubber Study Group at The Hague. On February 24, 1947, the Malayan Union announced a new export duty, replacing the former fixed specific duty. The export duty now payable is an impost of 5% ad valorem, plus 1/4 cent (Straits currency) per pound on rubber at a value of 41 7/8 cents (Straits) per pound.

The production of rubber in Dutch Borneo has declined sharply since last October, according to Mr. Holt. Serious deterioration of economic relations between the Indonesians and the Dutch in Borneo has been reflected in reduced purchases of rubber by the Rubberfonds, the official Dutch rubber buying agency. While there has been an increase in the amount of rubber smuggled from Borneo to Malaya in recent months, the total new supplies from Borneo in January were only half of the average rate for September and October. The declines in Rubberfonds purchases are attributed by the Dutch to smuggling and to political unrest resulting from infiltration into Borneo of Indonesians from Java. The increase in smuggling is reflected in the Malayan import statistics; from the standpoint of overall supply, the shrinkage in total production is very serious. The imports into Malaya from Dutch Borneo in February were only 1,617 tons, indicating further decline in production.

RUBBER PRODUCTION IN DUTCH BORNEO
In Long Tons

Month	Dutch Rubberfonds Purchases	British Malayan Imports	Total Dutch Borneo
1946			
July	6,254	1,907	8,161
Aug.	6,689	1,605	8,294
Sept.	6,373	1,122	7,495
Oct.	10,008	614	10,622
Nov.	4,253	1,515	5,768
Dec.	4,170	2,588	6,758
1947			
Jan.	1,973	2,484	4,457

The effect of this development in Borneo has been to reduce the volume of rubber, available from the entire Netherlands India, from an average of 24,500 tons a month in July-October to an average of 20,800 tons a month in November-January, with the January total only 19,416 tons. Unless conditions change, therefore, the outlook for supplies from this area during 1947 is no substantially less promising than it appeared to be last November, when the Rubber Study Group estimated the total new supplies from the Netherlands India in 1947 at 350,000 tons.

Only a small percentage of the rubber from the Netherlands India is now reaching world markets through the Rubberfonds.

NETHERLANDS INDIES RUBBER PRODUCTION
In Long Tons

Month	Rubberfonds Purchases	Malayan Imports	Total New Supply
July	8,588	17,963	26,551
Aug.	8,513	16,699	25,212
Sept.	7,761	13,337	21,098
Oct.	11,189	13,944	25,133
Nov.	5,065	15,084	20,149
Dec.	4,491	18,341	22,832
Jan.	2,209	17,207	19,416
Feb.	*	18,370	

* Not available

The department of Commerce issued its first postwar "Rubber Industry Report" since November, 1942, with its March, 1947, publication. This 22-page mimeographed bulletin is to be published bimonthly and may be obtained from the nearest field office of the Department of Commerce or through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of 50¢ a year. The March report summarizes principal statistics relating to rubber through the war period and to the end of 1946 and provides background information. Future reports will provide more timely information and will contain occasional special features. The reports will in general constitute a review of current statistics and news of importance relating to the domestic and international trade in rubber and rubber products.

Pennsylvania Rubber Co., Jeannette, Pa., has added to its athletic ball sales staff Stanley J. Olenn, who will cover the Pittsburgh area. He had previously served there as assistant football coach at the University of Pittsburgh.

Labor-Management Relations News

Negotiations between the Big Four companies and the United Rubber Workers of America, CIO, on the union's demand for 26¢-an-hour increase in wages were resumed in Cleveland, O., March 5. The discussions were terminated without a settlement on March 17, and a strike was called by the union to start at midnight March 23 in all of the Goodyear, Goodrich, Firestone, and U. S. Rubber companies' plants. On March 22 the union and the companies met again in Cleveland, and a settlement was announced on March 23 which gave the rubber workers an increase of 11 1/2¢-an hour in their wages, retroactive from February 2, 1947. Then a few days after the Big Four settlement Pharis Tire & Rubber Co., Newark, O., and The General Tire & Rubber Co., Akron, O., announced they would grant their workers the same wage increase of 11 1/2¢-an hour. Employes of the Passaic, N. J., plant of United States Rubber Co., had walked off their jobs on March 20 because of a local dispute and general dissatisfaction with the progress of the Big Four negotiations.

The Big Four Settlement

The negotiations between Big Four companies and the URWA, which were broken off on January 27, were resumed in Cleveland on March 5 but after about ten days' discussion were terminated again on March 17. The union reduced its original demand from 26¢ an hour to 16¢ an hour, but the companies' best offer was for a 10¢-an-hour increase, which the union announced was not satisfactory. L. S. Buckmaster, president of the union stated that the URWA had agreed to discard the 10¢-an-hour night-shift bonus and modify or eliminate several other issues in its original demand including acceptance of January 1, 1947, as a retroactive award date instead of November 1, 1946. According to Mr. Buckmaster, this question of the retroactive award date was one of the points that brought an end to the negotiations on March 17.

L. M. Buckingham, spokesman for the rubber companies, said he was surprised at the union's action. He said no other mass production industry in the country offered the wage increase that the rubber industry gave its employes last year. He pointed out that the 18 1/2¢-an-hour increase granted March, 1946, of which 12¢ an hour was made retroactive to November 1, 1945, gave rubber workers the equivalent of 22 1/2¢-an-hour increase for one year.

The URWA called for a strike of the 50,000 workers in the 42 plants of the Big Four companies to start midnight, March 23, and plans were made for walkouts in the various localities throughout the country where the plants were located. Despite an unyielding attitude on the part of both the companies and the union, during the latter part of the week of March 17, rumors of a final attempt at settlement before the strike deadline on March 23 began to be heard. Concern was expressed by spokesmen for the automobile industry, since a strike in the tire plants of the Big Four would seriously curtail operations in the auto plants in from one week to three weeks, it was said.

Then on March 22 it was announced that the companies and the union were meeting again in Cleveland, and on March 23 the strike was called off when the union accepted an offer of an increase of 11 1/2¢ an hour, retroactive to February 2, 1947. Rubber company spokesmen reported that the increase would cost the companies nearly $50,000,000 annually. The average hourly wage of the workers under the terms of the settlement were indicated as about $1.45 1/2 an hour. Industry will make every effort to absorb the increase and no advance in the price of rubber products will be necessary, it was further declared.

The hope was expressed that this settlement will serve as a pattern for meeting similar reasonable requests for cost-of-living increases and that prices in general can be lowered through moderation of the wage increase demands and overall increased production in American industry.

According to one report, the new agreement may point to an end to Big Four bargaining. While it makes possible a reopening of the wage issue on a Big Four basis in 120 days, its wage provision will be incorporated in company-wide or local contracts negotiated in 1947 between the union and any of the Big Four.

Another report expressed the opinion that the settlement of the wage issue in the rubber goods manufacturing industry means that auto workers, steel workers, electrical workers, and other mass production workers organized by CIO unions will accept wage rises of approximately 11½¢ an hour, and that settlements in these industries will be accelerated. The prospects of avoiding a sharp recession have also been improved by the moderate basis of the wage rise since price cuts will soon be needed to stimulate consumer demand.

A management official for the rubber companies said that he was "greatly pleased that both sides attempted to understand the other fellow's viewpoint and acted like reasonable people—and were able to maintain that relationship" during the course of the negotiations.

Mr. Buckmaster, was quoted as saying that he was not entirely satisfied with the final settlement and had hoped it would be better, but still expected that it should be acceptable to most of the union members. Local union officials in Akron were divided in their attitude, but in general were satisfied with the terms of the wage agreement.

Pharis and General Follow Wage Pattern

Pharis Tire & Rubber announced on March 24 that it would conform with the agreement between the URWA and the Big Four companies, increasing hourly wages 11½¢ retroactive from February 2, 1947. This company had signed a working agreement on March 12 with the local URWA union on hours and working conditions with a blank clause to be filled in after the Big Four agreement on wages had been reached. The hours and working conditions contract covers the period from February 26, 1947, until May 1, 1948.

Two of the important clauses in the new contract state that employes having 15 or more years of service with the company will now receive three weeks vacation annually. Previously the three-week holiday had been granted only to workers having 25 years' service.. The other clause provides that sick leave can now be accumulated for a maximum of 12 days. Accumulation occurs at the rate of one day a month of perfect attendance at work. Use of this time is authorized in the event of sickness or injury substantiated by a doctor's report.

The General Tire plant at Akron also reached an agreement with representatives of the local URWA union for a wage increase of 11½¢ an hour, it was announced March 27.

U. S. Rubber Plant Strike

Most of the 3,500 workers at the Passaic plant of U. S. Rubber walked off their jobs on March 20 in connection with a dispute over a time-study check up and "general dissatisfaction" with the progress of the Big Four wage increase negotiations, according to a statement of the local URWA union president. The workers returned to their jobs, however, on March 24.

Rubber Controls Continue

Except for the ban on private importation of natural rubber and natural rubber latex, which was lifted by law March 29, present rubber controls will continue in force, Civilian Production Administration announced on April 1. Remaining controls provided by R-1 apply to allocation, consumption, and inventories of rubber, specifications for rubber products, and to the importation of rubber products. Originally imposed under the War Powers Acts, they were extended for one year under Public Law 24, 80th Congress, signed by President Truman on March 29.

This law permits any person to import or accept delivery of rubber and natural rubber latex. To conform with it, CPA on April 1 issued Direction 14 to its rubber order, cancelling provisions which previously restricted importation to the Reconstruction Finance Corp. Direction 14 provides that "any person accepting delivery of natural rubber and natural rubber latex for the purpose of consuming same" must comply with the rubber order.

For the first time since Pearl Harbor, tire manufacturers may now make white sidewall passenger-car tires, according to Amendment 2 to Appendix II of R-1, issued April 4. There will be no restriction on quality. The ban on white sidewall tires has been lifted because tire production has reached such heights that the control is no longer necessary. Estimated tire production for the first quarter of the year was higher than ever before—more than 19½ million. Distribution pipelines have been built up; passenger-car tires are available in every community, and export restrictions on passenger-car tires have been removed.

The order was originally issued, and retained through the reconversion period, as a means of concentrating all production facilities on overall tire production because the operation of adding white sidewalls adds to the time required to manufacture a tire.

Although the restriction has been lifted, shortages will delay the production of white sidewall tires in the quantity needed to satisfy demand.

Titanium oxide, the white pigment ordinarily used in white sidewalls, is in short supply and is also under heavy demand from other industries. There is a world shortage of top-quality pale crepe rubber, which is sometimes used in the white sidewall applied to the tire. Because pale crepe rubbers are required in the manufacture of many essential druggists' sundries, no rubber of this quality will be made available for tire production. However special types of non-staining general-purpose American-made rubber have been developed which can be substituted for pale crepe rubber in the manufacture of tires and will ease this difficulty.

Report on Latex

Rubber Development Bureau, 1631 K St., N. W., Washington 6, D. C., has stated that the world can use more than 10 million gallons of latex a month as soon as it is available, with much of the latex being used to make latex foam. The foam, one of the great prewar developments in the field of rubber, has already revolutionized cushioning standards in the transportation field and is beginning to find its way into the home. The six domestic rubber companies which make latex foam are waiting for the raw material to become more plentiful before supplying the home with latex foam mattresses, chair and divan upholstery, and pillows.

The Bureau emphasized that latex foam should not be confused with ordinary sponge rubber. The former is a brand-new material made up of millions of tiny, interconnected cells of pure rubber latex, with more than 250,000 such cells in each cubic inch of foam. Besides its comfort, the foam is said to offer lightness, cleanliness, coolness, and durability. World production of the foam at present is estimated at less than 10% of the demand, but it expected to increase greatly during the next year or two. Best estimates are that it will be some time next year before enough latex will be available to permit domestic foam manufacturers to develop the vast market for this new cushioning material.

War Assets Administration, Washington, D. C., in its recent listing of surplus property for sale included: miscellaneous rubber products and mechanical packing (used and new) costing $32,600 and including rubber cement, gaskets, diaphragms, grommets, packing, fiber asbestos, sponge rubber pads, and tubing; mill supplies and rubber products, consisting of belts, rubber and synthetic rubber goods for industrial use, neoprene, rubberized felt, tape, and washers; unused rubber and synthetic rubber hose costing $47,000; 21,800 rubberized-cloth life rafts, costing $3,813,000; 500 centrifugals and separators, $1,125,000.

Export Ruling Changes

United States Department of Commerce, Office of International Trade, Washington, D. C., on March 26 announced that export controls on new and used passenger-car tires will be removed effective April 1, 1947. The decision to decontrol tires is based on the great improvement in domestic production, OIT explained. Production of passenger tires was 28,392,000 in 1945 and increased to 66,508,000 in 1946, it was pointed out. Output in 1939 was 49,933,000. During 1945, OIT stated approximately one tire was available for domestic replacement for each car in service; while 1946 production provided two replacement tires for each car.

"Current Export Bulletin" No. 398, April 1, 1947, reports that the Department has discontinued limited distribution license procedure for exporting passenger-car tires, which have been placed under general license to all Group K destinations. Validated licenses are still required, however, for the exportation of passenger-car, truck, and bus tires to Group E countries.

Also effective April 1, among the many commodities removed from the Positive List and placed on general license for exportation to all destinations in Group K are the following: automobile casings (include retreaded tires, used casings averaging $2 and over each); other automobile casings (passenger-car tires); viscose high-tenacity tire cord or yarn, on cones or warps, treated, dipped, or untreated (fuel cell high-tenacity cord or yarn included); cord tire and fuel-cell fabric, woven filament (rubber coated).

EASTERN AND SOUTHERN

Rubber Toys Featured at Fair

The forty-fourth annual American Toy Fair, previewing the largest showing of toys, games, and hobby materials ever assembled, was held in New York, N. Y., on March 10 to 22. A total buyer attendance of more than 10,000 viewed the 800 exhibits which covered seven floors at the Hotel McAlpin, five floors at the Breslin Hotel, and permanent showrooms at 200 Fifth Ave., 1107 Broadway, and other buildings. Buying was far in excess of the normal peacetime record and indicated that retail toy volume this year would reach a total of 300 million dollars, a 20% increase over 1946. According to H. D. Clark, general manager of the Fair, steel, rubber, and wheel goods manufacturers, whose groups comprise 50% of the total toy business, have booked business close to total capacity. Prices averaged about the same as a year ago, and the consensus of manufacturers was that buying is now gradually turning back toward normal peacetime procedures.

Applications of rubber in toys were featured at the Fair to such an extent that it was difficult to find an exhibit in which no rubber items appeared. Rubber company exhibiters reported an increase in demand which was generally not in excess of capacity, although the Sun Rubber Co., Barberton, O., was continuing allocations on the sculptured rubber balls. Rubber items in shortest supply appeared to be tires for tricycles, carts, and other wheel goods.

The Barr Rubber Products Co., Sandusky, O., showed rubber balloons, sponge balls, and inflated balls. Auburn Rubber Corp., Auburn, Ind., displayed an extensive assortment of all-rubber toy cars, tractors, and tools. A complete line of sponge, sport, and inflated balls was shown by Eagle Rubber Co., Inc., Ashland, O., while Eastern Rubber Specialties Co., South Norwalk, Conn., featured rubber and latex toys for crib and carriage use. A great increase in the number of rubber doll manufacturers was noticeable throughout the Fair, including the display of rubber mannequins and dolls by Fashiondol-Latexture Products, Inc., New York. The Maple City Rubber Co., Norwalk, O., exhibited toy and novelty balloons.

Molded Latex Products, Inc., Paterson, N. J., displayed its Kaysam-process latex toys and play balls. Oak Rubber Co., Ravenna, O., exhibited Squeeze-Me latex toys and Oak-Hytex balloons; and Seiberling Latex Products Co., Akron, O., showed new sculptured balls in addition to its standard play balls, novelties, and sundries. The Sun Rubber Co., Barberton, O., had an extensive exhibit featuring rubber dolls, animals, cars, planes, tanks, Walt Disney characters, and sponge rubber blocks, besides rubber household special ties. Beach balls were also on display by the Van Dam Rubber Co., New York, together with a comprehensive assortment of toy and advertising balloons.

Felix Edgar Wormser has resigned as secretary and treasurer of the Lead Industries Association, 420 Lexington Ave., New York 17, N. Y., to accept an appointment as assistant to the president of the St. Joseph Lead Co., 250 Park Ave., New York 17, on May 12, 1947.

J. Gordon Collins

Joins Amecco Chemicals

J. Gordon Collins has been named vice president and general sales manager of Amecco Chemicals, Inc., 60 E. 42nd St., New York, N. Y., manufacturer of industrial chemicals. Mr. Collins was graduated from Massachusetts Institute of Technology in 1928 with a B.S. degree in chemical engineering. Appointed to the staff training group of The Goodyear Tire & Rubber Co., Akron, O., he specialized in reclaimed rubber and in 1930 became chief chemist of the E. H. Clapp Rubber Co., Boston, Mass. In 1933, Mr. Collins joined U. S. Rubber, Naugatuck Chemical Division, and specialized in technical sales development until he was appointed sales manager for agricultural chemicals in 1942. In 1946 he was made manager of sales development for special chemicals.

International Standards Organization

The American Standards Association, 70 E. 45th St., New York 17, N. Y., recently received word from Charles LeMaistre, secretary in charge of the provisional office, that the International Organization for Standardization, set up provisionally at a meeting of 25 nations in London last October, has become the official body for international standardization work, following ratification of its constitution and by-laws by the national standards bodies of 15 nations. The United States, the first country to ratify the new organization through approval of the ASA board of directors, has now been joined by Chile, Brazil, Australia, Mexico, Finland, France, Switzerland, China, Austria, United Kingdom, Sweden, India, Czechoslovakia, and Denmark.

Difficulties in securing office space in Geneva, Switzerland, which will be ISO headquarters, have been important factors in delaying the opening of an office, although the technical work of the organization is going forward without delay. A committee representing the United States, Great Britain, France, Belgium, Russia, and Brazil is surveying the field to secure a secretary-general to take charge of the permanent ISO office, expected to be in operation by early autumn. Final decision on the selection of the secretary-general will rest with the ISO council representing 11 nations, probably at a meeting at Geneva in June. Present plans call for securing a temporary office in Geneva as soon as conditions permit.

Report on Guayule Program

Intercontinental Rubber Co., Inc., 745 Fifth Ave., New York 22, N. Y., in its annual statement to stockholders reported that in response to the government's war requirements during the past five years, Intercontinental's subsidiary, Continental-Mexican Rubber Co., Inc., milled nearly twice as much shrub as it had ever milled before in a like period. As a natural result of this excessive rate of milling, the wild shrub supply in Mexico was reduced tremendously, necessitating the curtailment to half capacity of the Torreon factory and a slight reduction at the Catorce factory beginning last July. This action, of course, greatly reduced the production of rubber from Mexico, as follows: pounds of rubber produced for 1946, 8,587,200, against 12,274,600 in 1945; metric tons of shrub milled, 31,029, against 47,648.

Foreseeing this fast-diminishing supply of wild shrub as early as 1941, Intercontinental in 1942 decided to undertake the cultivation of guayule on a large scale in order to overcome this shortage. By the end of 1946 the company had planted 6,500 acres of guayule, and it is expected that the additional 3,000 to 3,500 acres will have been planted by mid-summer, thus completing a total of approximately 10,000 acres as originally contemplated for 1947. While six-year-old shrub is the company's objective, it will be necessary to harvest some shrub sooner, with consequent replanting, in order to keep the factory going.

The company also reports progress in improving the quality of the guayule rubber produced, and research in this field is being continued with encouraging prospects of further success.

American Hard Rubber Co., 11 Mercer St., New York 13, N. Y., through President Frank D. Hendrickson has announced the following changes in executive personnel, effective March 12. Allen H. Ottman is now vice president and comptroller, with authority over the accounting activities of the company; and new vice president in charge of sales is Roland Reppert. Leslie Weeden, now vice president—manufacturing, is responsible for the manufacturing, engineering, and research activities of the company. Then on March 24, Kenneth J. Durant was made plant manager at the Akron, O., plant, responsible to Mr. Weeden.

Mechanical Packing Association held its annual meeting in New York, N. Y., March 7, at which the following officers were elected: president, Elmer L. Spence, manager of the packing department, United States Rubber Co.; vice president, A. W. Swartz, Sr., of Linear, Inc.; secretary-treasurer, F. H. Luhrs; directors, C. A. G. Pease, Endura Mfg. Corp., Charles E. Cunningham, Flexitallic Gasket Co., and A. R. Byrnes, Union Asbestos & Rubber Co.

Issuing New Debentures; Other U. S. Rubber Developments

United States Rubber Co., Rockefeller Center, New York 20, N. Y., on April 1 announced the filing with the Securities and Exchange Commission at Philadelphia a registration statement covering $40,000,000 of 20-year 2 5/8% debentures, due April 1, 1967. It is expected these debentures will soon be publicly offered by a banking group of approximately 80 underwriters headed by Kuhn Loeb & Co., New York.

Proceeds of the new issue will be added to the general funds of the company and will be used principally to provide additional working capital. Additional working capital will be required, the company explained, to handle the present volume of business which is at a rate more than double than just before the war. It will also be needed as a result of the return to a more normal turnover of inventories and accounts receivable than existed during the war and in 1946; the wage increase of 11 1/2¢ an hour recently agreed upon; and the termination of exclusive control of the purchase of crude rubber by the government, which will make it necessary for the company to resume the financing of purchases of natural rubber in the Far East.

New Products Reported

To help meet the need of luxurious carpet underlay that will resist heavy traffic, U. S. Rubber is now manufacturing chemically blown sponge rubber for immediate delivery. The new underlay is recommended for use under carpets in hotels, theaters, restaurants, department stores, public institutions, and buildings. Tests indicate that it will increase carpeting wear by almost a third. It is said to be permanently resilient, washable, long wearing, lint-free, and proof against moths and vermin. The underlay is being marketed through leading distributers of floor coverings and is available in 36- and 53-inch widths, with a standard thickness of 1/4-inch. The underlay, moreover, can be supplied up to 1/2-inch in thickness for special installations. Widths and lengths can be joined with adhesive binding tape. For use to anchor scatter rugs on highly polished or marbleized floors, the underlay is being sold in 24-, 32-, and 54-inch widths, 3/32-inch thick.

Slipcovers made of Strex fabric will be ready for distribution in limited quantities this spring, the company's textile division announced. The fabric is stretchable and derives its elasticity from cotton yarn twisted by a special process into the shape of a coil spring. The slipcovers will be made with two-way stretch in various colors and styles to fit all types of chairs, davenports, and other upholstered furniture.

Rubber insulators have been developed by U. S. Rubber engineers to isolate the vibrations of jolt machines used to make sand molds in foundries. The insulators are being employed for the first time to mount 13 machines weighing from 3,000 to 22,000 pounds in the foundry of the new Wright Aeronautical Corp. aircraft engine plant in Woodridge, N. J. The rubber isolates shock so completely that sensitive instruments in a research laboratory less than 50 yards from the machines can be operated without interference. The molds are employed in casting aluminum and magnesium aircraft engine parts. They are jolted up and down by means of pneumatic power to pack the molding sand around the patterns. Each machine is secured to a large concrete block which rests on the rubber mountings. These blocks weigh as much as 40,000 pounds. With the rubber insulators, all 13 machines in the plant may be operated in unison without setting up vibrations in surrounding areas.

U. S. Rubber prior to the war developed and patented a powder that can be blown into automobile inner tubes to reduce static shock and car radio static. The powder will soon be available to motorists through distributers of U. S., Fisk, and Gillette tires. Static electricity in cars is built up by the moving tires and is affected by weather conditions and road surfaces. Realizing that the rubber tires prevent discharge of the static electricity to the ground, tire engineers developed the powder for application into the inner tubes. An air hose and a specially designed container are used to inject about one tablespoonful of powder into each tube after the tube has been deflated and its valve core removed. The powder tends to cling permanently to the walls of the tube for the duration of the tube's life, modifying the electrical behavior of the tire and tube to eliminate or greatly reduce static troubles.

Steel wire is used in an experimental tire developed by U. S. Rubber for use on heavy trucks. The strength of the steel makes the tire more resistant to blowouts and permits the use of fewer plies, to result in a cooler-running carcass.

Work is nearing completion at the Passaic, N. J., plant on one of the largest rubber expansion joints ever produced. The joint is 12 1/2 feet long and more than seven feet wide. It will be used to convey steam from a turbine to condenser in a New Orleans, La., power plant. The flexible connecter is built to withstand vibration and extreme temperature changes.

Foam rubber cushioning for home upholstery use is now being sold in the drapery and upholstery departments of leading stores, U. S. Rubber announced. This cushioning material is practical for upholstery at home of occasional chairs, dining room, bedroom, and bridge chairs and dinettes, window seats, vanity benches and stools. Other applications include cribs, play pens, headboards for beds, cornices, and terrace furniture. Known as Koylon foam, the cushioning is available in one-half and one-inch thicknesses and in soft, medium, and firm densities. Sheets, 34 inches wide and 62 inches long, can be cut in the store to the size desired, later being further shaped at home from a pattern. The first step in home use of the foamed rubber is making a pattern by tracing the border of the seat or back to be upholstered on a flat piece of paper, allowing an extra quarter-inch around the edge for upholstering pull-in. Next the paper pattern is placed on the foam rubber sheet, and its outline traced with pen and ink on the cushioning. The cushioning is then easily cut to shape with scissors, placed on the seat or back, and covered with the upholstery fabric.

Fireproof drapery fabrics of asbestos and glass have been developed by the company's textile division for use in theaters, night clubs, restaurants, auditoriums, airplanes, trains, and similar places of public assembly. The new fabrics are stated to be exceptionally light in weight and to have excellent draping qualities. They will be produced in the form of gray goods suitable for dyeing and printing in a variety of colors and patterns. The asbestos-glass development, an outgrowth of wartime research on fire-resistant materials, gives a fabric with high flexibility and strength, low stretch with good abrasion resistance, and stability under atmospheric changes.

Tomato fruit rot, which last year spoiled 20-80% of the country's garden crop, can be prevented this season with a new chemical called Dust-Spray, designed by U. S. Rubber especially for the home gardener. The chemical is a combination of powerful agents for killing both plant insects and fungus diseases, according to T. W. Brasfield, company product manager of agricultural chemicals. In trials last year at the company's experimental farm, tomato plants treated with Dust-Spray were free from fruit rot and produced at the rate of 11 tons of marketable fruit per acre, Dr. Brasfield stated. Untreated plants in the same field yielded only 1.2 tons of fruit per acre; the remainder of the crop rotted on the vine before ripening. Although other chemicals will control tomato fruit rot, Dust-Spray has the advantage that it will also kill such other tomato pests as flea beetles, lice, leaf blight, and fruit spot. Dust-Spray contains DDT and rotenone, two potent insect killers, plus sulfur and Phygon, which are time-tested fungicides. The new chemicals can be used either as a dust or a water spray. The material is ideal for people having just a few fruit trees or plants in the back yard or garden as it does away with the nuisance of buying separate chemicals for individual pests. Dust-Spray, it is claimed, will do the whole job by itself, being effective against many of the insect and fungus pests of vegetables, flowers, trees, and ornamental shrubs. The material comes in handy sifter-top containers and will be available in stores starting this spring.

The heaviest load ever lifted by a fighter plane was carried on the U. S. Royal Aircraft tires of the *Betty Jo* as it took off from Hawaii for the record-breaking 5,000-mile flight to New York. The rib-tread nylon tires carried 14 tons, consisting of the seven-ton plane and an equal weight in gasoline.

Other Company News

W. H. Kneass has been made Chicago district manager for U. S. Tires. He has been with the company since 1937, when he became a tire sales representative at Dallas; then in 1941 he was appointed district manager at New Orleans. He was in the company's war products division at Detroit and later was a manager of commercial merchandising at the general offices in New York. His most recent position was divisional manager for U. S. Tires at Los Angeles.

H. Douglas Tate has been appointed manager of agricultural chemicals development for U. S. Rubber. In his new position, he will take charge of the rubber company's agricultural laboratories at Bethany, Conn., where research is conducted on new chemicals to destroy insects, plant diseases, and weeds. He succeeds George L. McNew, who resigned to head the department of botany at Iowa State College. A native of New Albany, Miss., Dr. Tate was graduated from Mississippi State College. After obtaining a master of science degree at University of North Carolina, he studied further at Iowa State College, where he received the degree of doctor of philosophy in entomology in 1935. Dr. Tate joined the rubber company in charge of insecticide research in February, 1946.

Golf ball production is approaching a record-breaking level, but balls still will be short during 1947 although not so scarce as last year, U. S. Rubber reported last month. The shortage is anticipated owing to accumulated demand and lack of "carryover" stocks from last year, com-

bined with the fact there are many new golfers recently introduced to the game at recreation centers sponsored by the Armed Forces. The supply is expected to be tightest when the northern golfing season opens. Improvement is anticipated toward the latter part of the season.

The Woonsocket plant of U. S. Rubber, which completed 604,000 man-hours without a lost-time accident during the last quarter of 1946, was termed the safest factory in Rhode Island, at a recent meeting of the Blackstone Valley Safety Council in Pawtucket. This safety honor was won by the Woonsocket plant after a statewide safety contest in which 257 industrial companies in Rhode Island participated.

Advertising and Selling recently presented jointly to U. S. Rubber and Campbell-Ewald Co. of New York, Inc., a bronze medal "for a commercially sponsored program which contributes most to the advancement of radio advertising as a social force." Campbell-Ewald is the agency which handles the Philharmonic-Symphony broadcasts sponsored by the rubber company.

U. S. Rubber, sponsor of the New York Philharmonic Symphony Orchestra's regular Sunday afternoon radio concerts and its 1947 spring tour, will present a complete library of all available recordings made by the orchestra to the school systems of each of the 24 cities included in the tour. The music library consists of 38 volumes of records and ranges from works by the early masters of great music to leading present-day composers.

L. H. Gilmer Co., division of U. S. Rubber at Tacony, Pa., has changed its Chicago, Ill., address to 111 N. Canal St., Zone 6. A. B. MacFarland is division manager.

Martin Rubber Co., Inc., Long Branch, N. J., has taken over the AcRil Dental Corp., Long Island City, N. Y., and now is manufacturing all AcRil products at the plant at Long Branch. Martin Rubber is prepared to furnish AcRil, TissueLyke, and all other AcRil products made by the AcRil Dental Corp. and, in addition, is still manufacturing its own Martin Denture Acrylic.

The rubber company is also erecting a warehouse containing 5,000 square feet which will be ready this month. This building is another step in the firm's planned expansion, and will help alleviate the present crowded condition, caused by the fact that Martin is still operating on a three-shift basis, at full capacity. Additional buildings to be put up shortly are a separate office building and also a combination dining room and recreation hall for employes.

New York Belting & Packing Co., Passaic, N. J., has appointed Edward J. Hallam sales representative for Washington and Oregon, with headquarters in Portland, Ore. He will operate under the supervision of O. L. Wall, district manager in San Francisco, Calif. Mr. Hallam recently returned to the company after serving with the United States Army in the Pacific theater. He began his rubber career in 1929 as a workman in the company's hose manufacturing department at Passaic, but in 1939 was transferred to the sales department, where he handled special assignments prior to his military service.

United Carbon Co., Inc., Charleston 27, W. Va., has opened a New England district sales office at 302 United Bldg., 43 Leon St., Boston 15, Mass. Wm. A. Maguire will be in charge. A native of Providence, R. I., Mr. Maguire has been associated with United Carbon for a number of years in the Akron sales territory. Weller Chemical Co. was former representative in New England for the carbon black company.

Flintkote Co., Rockefeller Center, New York 20, N. Y., held its annual meeting in Boston, Mass., last month at which President I. J. Harvey, Jr., stated that sales for the first quarter this year will be about 50% higher than in the similar period in 1946 because new facilities built by the company are now coming into production. He also expects that profits for 1947 will be much higher than for 1946.

Rodic Rubber Corp., has moved its gentral offices from Garwood, N. J., to Allen Ave., New Brunswick, N. J.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., in its recent annual report revealed that a portion of its expansion program has been deferred by material shortages and other unusual construction conditions; while extension of research facilities also has been delayed by shortages of materials and other considerations. Plans were disclosed, however, for construction of new laboratories or additions to existing facilities which, when complete, will more than double the size of the company's research establishment. The program contemplates expanded facilities for research at 15 company locations, du Pont said.

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa., has appointed Martin G. Levens Cleveland, O., sales representative for the Columbia Chemical division. Following graduation from Gettysburg College in 1941, Mr. Levens joined the Atlas Powder Co. as acid and powder line supervisor and later served as chief chemist. Called to active service with the U. S. Naval Reserve in 1944, he served as a lieutenant aboard an LST in the Atlantic and Mediterranean areas. Since his release to inactive duty last July, Mr. Levens has been associated with Columbia Chemical's sales department.

Glenn W. Green has been made sales representative in the Chicago territory for the Columbia Chemical division. Prior to his service in the U. S. Army, Mr. Green had been laboratory superintendent for the Duquesne Light Co., Pittsburgh. He is a graduate of the University of West Virginia, with a B.S. in chemical engineering, and also is a member of the West Virginia Society of Professional Engineers.

New sales manager for the New York district of the division is Walter T. Johnson, with headquarters at 30 Rockefeller Plaza. Mr. Johnson joined the firm's research department at the Barberton, O., plant during 1930 and has been associated with the chemical division ever since. Following several years in plant production and technical service departments, he became manager of the Chicago district sales office for three years. Mr. Johnson is a graduate of the University of Minnesota with a B.S. in chemical engineering.

General Electric Co., Schenectady, N. Y., has appointed Robert A. Nisbet superintendent of the Waterford, N. Y., Works of its chemical department. These Works, now under construction, will be used for the manufacture of silicone products. Mr. Nisbet joined GE immediately after his graduation from Massachusetts Institute of Technology in 1926. He started as a student engineer, then became an engineer of factory equipment. In 1941, Mr. Nisbet was transferred to the general superintendent's office on special assignments and a year later became general foreman in the searchlight and ordnance division; in 1943, general foreman of the transmitter department; assistant to the superintendent of the regulator manufacturing division; and in 1945, assistant general foreman in the silicone pilot-plant of the resins and insulation materials division.

Prior Chemical Corp., 420 Lexington Ave., New York 17, N. Y., last month marked its twenty-fifth anniversary.

Pioneer Latex & Chemical Co., Inc., according to President Stephen G. Paliska, has moved from 10 Ave. B, Newark, to Lincoln Blvd., Middlesex, both in N. J. The new plant, comprising about 30,000 square feet of floor space, with a 12-car railroad siding, and located on about three acres of ground, will house both the rubber and the bituminous divisions of the company as well as the main offices and research laboratory. The new facilities will enable Pioneer to produce approximately 20 million gallons of natural and synthetic rubber latex compounds, rubber adhesives, mastic flooring, emulsified asphalts and resins, cutbacks, Gilsonite solutions, sewer joint compounds, waterproofing and dampproofing materials, tile cements, underlayments, acid resistant coatings, car cements, and a large variety of custom compounded products.

American Machine & Foundry Co., 511 Fifth Ave., New York 17, N. Y., has appointed Herbert C. Johnson sales representative for its AMF Glen mixers for industrial use, to cover New Jersey, Pennsylvania, West Virginia, Maryland, Delaware, and Virginia. Mr. Johnson, a graduate mechanical engineer from the University of Pennsylvania, spent the last seven years in selling machinery and equipment and prior to that had worked in the engineering department of a prominent electrical manufacturer.

Pantasote Co., Passaic, N. J., has appointed Edward Hazlehurst technical director to head all technical operations from basic research to product developments and manufacturing processes. From the very earliest days Mr. Hazlehurst has been identified with the inception and growth of coated fabrics. For 17 years he was associated with Congoleum Nairn, Inc., mostly as chief chemist of the Kearney plant. Then during the war he went to the vacuum tube plant of Western Electric Co., and when hostilities ended he was entrusted with engineering the company's electronic shop, the post he left to join Pantasote Corp. Mr. Hazlehurst received his B.S. degree in chemical engineering from the University of Pennsylvania and is a Fellow of the American Institute of Chemists and an associate of the Institute of Radio Engineers.

OHIO

Firestone Appointments

The Firestone Tire & Rubber Co., Akron, has appointed John J. Riedel division merchandise manager of the home and auto supply department to succeed E. L. Parker, who is entering a private manufacturing business. Mr. Riedel, who has supervised buying, selling, and merchandising of toys for Firestone since May, 1943, will now head the division which handles all recreation supplies, toys, wheel goods, leather goods, and clothing. During the three years he was in charge of toy merchandising, sales increased 265%. Prior to joining Firestone, Mr. Riedel had been merchandise manager with the Chicago Mail Order Co. and Interstate Department Stores.

George M. Jenkins has been promoted to the managership of truck tire sales. Mr. Jenkins was first employed by Firestone in 1925 as an instructor in the service school at Akron. He successively held jobs as service manager in Kansas City and Chicago, general line salesman, assistant district manager, store manager and store supervisor in Chicago, store supervisor in Minneapolis, and district manager in Milwaukee. Since 1942, Mr. Jenkins has been in charge of off-the-highway tire sales in Akron.

Nylon Tire, New Plastic Announced

A new premium-line passenger-car tire using nylon cord in the tread ply has been announced by Firestone. According to L. R. Jackson, company executive vice president, the nylon tread ply concentrates additional strength under the center of the tread where impacts, punctures, and bruises are most likely to occur. Engineering data on the new tire, known as the Imperial, shows it to give much more tread wear than prewar premium-line tires. The new Imperial is said to be safer, stronger, and more economical because of the extra ply of nylon safety cord. Other important engineering features of the tires are two additional circumferential ribs. The nine ribs have combined the advantages of a gear-grip tread design with a special non-meshing arrangement of the 4,644 sharp-edge angles that assure a maximum in non-skid protection. Silent running and automatic pebble ejection are also features of the scientifically designed tread. The tire has one of the widest treads and flattest contours yet developed for passenger cars. These features increase riding comfort by providing a larger tire-cushion or footprint for the automobile. Tread wear is also distributed more evenly, thereby increasing mileage life. The new tire is now in production and will be made with white sidewalls as soon as government restrictions are relaxed.

A new, ultra-fine Velon plastic filament has been developed and is now being used successfully in the weaving of soft-hand fabrics, according to P. P. Crisp, president of Firestone Industrial Products Co., Akron. The finer filament will produce fabrics as soft as any yet made from extruded monofilaments, yet will have the stainproof and fadeproof characteristics of all Velon materials. Most Velon filament production to date has been eight and 12 millimeters in diameter, with a yardage of 4,000-8,000 per pound. The new filament is only five millimeters in diameter, and has a yardage of approximately 22,000 per pound. The finer filament is expected to find application in draperies, home upholstery, bed spreads, and table coverings. Firestone is expanding its Velon production as rapidly as possible and hopes to offer the new finer filament to the textile industry during the second half of 1947.

The first radio telephone to be installed in an automobile in the Akron area is now in service on one of Firestone's Cleveland-Akron shuttle cars. Installation of the telephones in other company fleet cars is anticipated upon completion of the present experimental test program. Advantages of the automobile telephones are numerous. Besides saving car trips by providing for communication to the drivers en route, executives can also handle last-minute details with their offices while being driven in the cars. Since the telephone can connect into a switchboard, car passengers can complete a call to any place in the country. In Akron, the transmitting tower for mobile radio-telephone systems will be atop the Bell Telephone Building. Cleveland's east and west side receiving towers and the downtown transmitting station are being used at present within a 20-mile radius of Cleveland. Essentially the only difference in operation between the radio telephone and the home telephone is that a transmitting and receiving switch on the receiver arm has to be alternately depressed during a conversation as you talk or listen.

A "First-Day Cover," a letter envelope, sent us from Washington, D. C., as a special recognition of the issuance of a new 5¢ air mail stamp by the United States Post Office Department, bears this stamp issue postmark. Moreover to commemorate the successful use of helicopters in speeding air mail service in the New York area, this cachet depicts the first delivery of helicopter air mail from LaGuardia Airport to downtown Manhattan. The group pictured receiving this first helicopter mail in New York includes Roger S. Firestone, president of Firestone Aircraft Co., whose craft was used; Albert Goldman, postmaster of the City of New York; Gail E. Sullivan, Assistant Postmaster General in charge of air mail; and Wm. J. O'Dwyer, mayor of New York.

Big tires are big business for Firestone. When the Army Air Forces needed its first big tire for the B-29 bomber, Firestone engineered an eight-foot smooth contour tire and built a giant mold in which to cure it. This mold, it is claimed, although more than eight years old, still remains the largest in the world; the top section alone weighing more than 32,000 pounds. The largest tire ever cured in this mold was the earthmover tire used by the Army Engineers in airfield construction. This tire was 9.5 feet high and 38.7 inches wide, and had a carrying capacity of 49,200 pounds at 25 m.p.h., and weighed 3,646 pounds with its tube and flap. When the R. G. LeTourneau Co. developed its concrete house-laying machine, Firestone changed this mold to produce earthmover tires that are 8.5 feet high and 32.6 inches wide and are said to be the largest earthmover tires currently being produced in the rubber industry.

H. B. Morris

Polson Plant Improvement

Plans to complete both a new boiler room and a new mill room, this year, are well under way at the Polson Rubber Co., Garrettsville, O. These two new structures, however, do not represent any expansion of plant output, according to W. J. Frisby, executive vice president, but are merely routine replacements of inadequate facilities and worn-out equipment. Hence this whole plant improvement program will regularize, but not enlarge tube output. As a matter of fact, these additions have been contemplated for several years, it was learned, to improve sanitary and working conditions around the plant as well as to safeguard the company and its employes against further shutdowns arising out of mechanical failures.

Also provided will be dust collectors of the latest design, such as the new forced-air collector installed over the holidays this year.

The mill room proper will be approximately 50 by 68 feet and will house the company's entire rubber mixing equipment. Steel for this project has already been assured by purchase and is being fabricated from present warehouse stocks for spring delivery.

Steel delivered and erected last month is for the new boiler room which will house two new 200 h.p. Erie City boilers by the end of the current year. The new boilers will greatly improve the company's steam generating efficiency and will replace the two old boilers which have rendered 24-hour service all through the war period.

Eagle Rubber Co., Inc., Ashland, has announced that H. B. Morris has joined its staff as technical director. Mr. Morris brings to Eagle a varied and valuable experience gained in chemical and research divisions of the rubber industry. He received his degree in chemistry from Gettysburg College and also attended Akron and Johns Hopkins universities.

Mr. Morris was with the Firestone Tire & Rubber Co. in Akron and the Firestone Rubber & Latex Products Co. in Fall River, Mass., from 1931 to 1940. He then went to United States Rubber Co. for two years. From 1942 until 1945 he served in the Chemical Warfare Service in the United States Army. Prior to joining Eagle Rubber, Mr. Morris was technical director of Killian Mfg. Co., Akron. He is a member of the American Chemical Society and its Division of Rubber Chemistry, Kappa Delta Rho, and Phi Beta Kappa.

Harold Gray, Technical Superintendent of Tire Division, and J. P. Bracht, Company Airplane Tire Engineer, Examine One of the Special Goodrich Tires Used on the Navy's Supersonic Jet Airplane, Skystreak

Opens Troy Plant

A new factory housing the airplane wheel and brake division of the B. F. Goodrich Co., Akron, has been formally opened at Troy, O. The plant, which started operations last November, will make brakes and wheels for all sizes and types of planes—ranging from the five-pound unit for a one-seater to the 334 pound wheel-and-brake used on the Army's new B-50. Every four-engined American bomber built during the war was equipped with the Goodrich expander tube brake, T. G. Graham, company vice president, pointed out.

Equipment has been moved to Troy from the Jackson, Mich., plant of Hayes Industries, Inc., whose airplane wheel and brake division was purchased by Goodrich in 1946. Additional new facilities have been installed in the building, which was an aircraft plant, operated by Waco, during the war.

The Troy operation calls attention to the expansion Goodrich has made in Ohio in recent years, Mr. Graham told a group of civic leaders and Air Force officials from Wright and Patterson fields. Besides the home office in Akron the pioneer Ohio rubber concern now has a divisional headquarters—chemicals—in Cleveland and an experimental station at Avon Lake and before the year's end will have opened a plastics processing plant at Marietta and its new research center at Brecksville.

Mr. Graham said his company had been a supplier to the aviation industry for 38 years—its first products in that field having been delivered "less than three years after the flight of the Wright Brothers at Kitty Hawk." Among the company's outstanding contributions he listed the de-icer, the stratosphere flying suit, the pre-rotation tire, multiple landing wheels for heavy planes, and the expander-tube brake.

The new $11,000,000 Tuscaloosa, Ala., plant of the Goodrich company is "successfully approaching its capacity production of 6,000 tires and tubes daily," according to Vice President T. G. Graham. Reported to be the most modern in the industry, the Tuscaloosa plant was completed late in 1946. It represents an investment by the company of $15,000 per worker, based on employment of 750 persons at capacity production. Mr. Graham also said this plant's output would be "a major contribution toward bringing tire supply into balance with tire demand this year."

Expansion of tire manufacturing facilities at Goodrich's Miami, Okla., plant involving an expenditure in excess of $1,000,000 was also announced by Mr. Graham, who reported that the increased facilities would boost production approximately 16% over the current output and would provide employment for about 150 to 200 additional workers. The new expenditures, making total cost of the plant more than $8,000,000, are earmarked for new equipment which will be installed by July 1, Mr. Graham said. Completed in 1944, the Miami plant now employs more than 1,000 persons.

Tires on the D-558 *Skystreak* unveiled by the Navy at the Douglas plant in El Segundo, Calif., carry far higher air pressure, 175 pounds per square inch, than any previous airplane tire ever constructed. According to Harold Gray, technical superintendent of Goodrich's tire division, this extraordinary pressure is needed in view of the great weight, 9,750 pounds at take-off, that must be carried on relatively tiny tires because of the limited space for retracting wheels in flight. The "transonic" plane's takeoff weight must be borne by two tires hardly larger than motorcycle tires, being 4.4 inches in cross-section by 20 inches overall diameter. The tires have eight-ply all-nylon carcasses and required more than a year and a half of intensive development work and experimentation, Mr. Gray declared.

Joseph B. Hanan, with Goodrich since 1918 and since 1932 staff superintendent of industrial products, recently resigned for health reasons. His successor is Lee D. Tidball, former staff superintendent of Plant 4, which post is now held by E. Arthur Gleason. John A. Reynolds succeeds Mr. Gleason as department manager of scheduling, planning, and service.

Goodrich has resumed production and sales of its Seal-O-Matic puncture-sealing safety tube, interrupted five years ago by the war. A gum-like rubber compound inside the tube under the tread and shoulder areas of the tire surrounds and grips tightly the puncturing objects so that no air escapes. When the puncturing object is removed, the gummy substance flows into the hole, sealing it immediately and permanently. Thus this substance prevents loss of air and eliminates the need of tube repair. In addition to this layer of sealing compound, the Seal-O-Matic is built with 64% thicker walls than ordinary tubes, allowing correct air pressures to be maintained much longer and giving the body of the tire the extra support needed to resist sudden shocks and sharp blows that cause bruises and breaks which frequently are the forerunners of blowouts. With this added wall thickness, the tube can resist much longer the roughness or pinching action of a cut or break in the tire, assisting discovery of the tire damage before a blowout occurs. Besides its value to the ordinary car owner, the Seal-O-Matic tube is especially important to doctors, and to police, fire, ambulance, and other vehicles where danger or delay from tires must be kept at a minimum.

United States Stoneware Co., Akron, through Harold Farkas, executive vice president and general sales manager, announced that Sidney A. Lewis, former captain in the Army Chemical Warfare Service, has joined the sales engineering force of the company's process equipment division. Mr. Lewis, an authority on electroplating of plastics, will make his headquarters at the New York, N. Y., office of the company, 60 E. 42nd St. He is a member of the American Chemical Society, the Electro-Chemical Society, the American Electroplaters' Society, and holds the rank of major in the Army reserve.

Mr. Farkas also announced the appointment of Robert L. Schroy to direct the sales activities of Columbia Rubber Co., Ravenna, a division of U. S. Stoneware. Mr. Schroy had been previously employed by Firestone Tire & Rubber Co. for some 11 years and is a graduate of Miami University. Columbia Rubber Co., formerly Lower Rubber Co., manufactures "Columbia" household rubber products as well as industrial custom molded parts.

The Eagle-Picher Co. held its annual stockholders' meeting in the company headquarters in Cincinnati, at which the board of directors was reelected for the coming year, including: Joseph Hummel, Jr., Joel M. Bowlby, Arthur E. Bendelari, Vincent H. Beckman, Carl F. Hertenstein, Robert E. Mullane, John J. Rowe, Carl A. Geist, Miles M. Zoller, T. Spencer Shore, and Elmer Isern. All officers of the company also were reelected, as follows: Mr. Bowlby, president; Mr. Geist, vice president, Secretary-Treasurer; and William R. Dice, vice president and comptroller.

Henry F. Palmer, who resigned last fall from the Firestone Tire & Rubber Co., is now engaged in private practice as a consultant serving the rubber and chemical industry, with headquarters at 715 W. Market St., Akron 3. Dr. Palmer spent 21 years with Firestone in various capacities and was assistant director of chemical laboratories during the last several years. He also spent 16 years with the subsidiary Xylos Rubber Co., as chief chemist. For two years during the war he also was production manager of Rubber Reserve's Rubber Section.

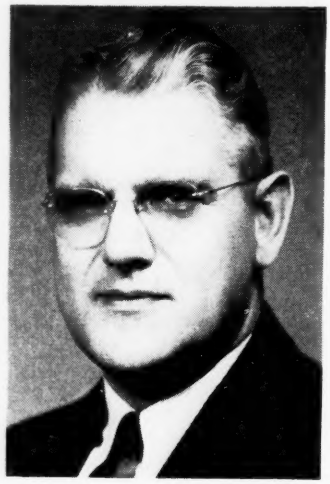
Goodrich's New Tire and Tube Plant at Tuscaloosa, Ala.

Joslyn, Others Advanced by Goodyear; New Developments Reported

Appointment of C. P. Joslyn to the newly created post of general manager of the chemical products division of The Goodyear Tire & Rubber Co., Akron, was announced last month by president E. J. Thomas. This organizational move gives further recognition to the rapid postwar expansion in this division of the company's business, which includes plastics and synthetics. It is designed to provide closer coordination of related activities in development, production, merchandise distribution, and sales.

As a result of urgent war needs, many new materials, generally classified in the field of chemicals, were created by Goodyear. Research and development in the production and processing of these materials were so greatly stimulated by the pressure of war that their adaption to postwar uses proceeded much more rapidly than would otherwise have been possible.

"Even though we have already experienced remarkable growth in this field, it is apparent that we have merely scratched the surface," Mr. Thomas said. "Such unusual prospects call for a closely integrated program of original research, pilot-plant development, production and sales analysis. We must select from the almost endless possibilities those which are highest in public interest and best suited to our position as producers."



C. P. Joslyn

Mr. Joslyn first came to Goodyear in 1926 as a mechanical goods representative in the Buffalo, N. Y., district, but was later placed in charge of mechanical goods sales in the Chicago district. He became mechanical goods sales manager in the eastern division in 1931 with headquarters in Akron and continued as such for ten years. He assumed charge of the sale of self-sealing fuel cells for military planes and later was made sales manager of the chemical products division.

Appointment of A. M. Finley as development manager of Goodyear's mechanical goods plant in Lincoln, Neb., also was announced last month by W. S. Wolfe, factory manager of domestic operations. Mr. Finley's new post fills a need resulting from current expansion of the Lincoln factory, Mr. Wolfe explained. Expanded facilities will triple production within a year, and more than $100,000 worth of laboratory equipment is being installed for testing materials and products. The laboratory will function under Mr. Finley's supervision.

A native of Sharon, Pa., Mr. Finley joined Goodyear as a chemist in 1929, immediately after graduating from Denison University. His entire service has been devoted to research and compounding for the company's mechanical goods division. He spent 1939 in Wolverhampton, England, setting up a development program for a new Goodyear mechanical goods plant. For several years Mr. Finley was chairman of the hose sub-committee of the American Society for Testing Materials, and during the war he worked closely with Army and Navy officials as a member of the rubber industry committee in charge of developing bullet-sealing fuel hose and other military products.

George K. Hinshaw, vice president and production manager of Goodyear Foreign Operations, last month announced several important changes in this division.

Henry M. Wiland has been made purchasing agent for Goodyear's tire factory in Buitenzorg, Java. This plant in Java, opened in 1935, was captured by the Japanese early in 1942. Louis Hochberg, prewar superintendent of the factory, returned to his Buitenzorg post several months ago to direct rehabilitation of manufacturing facilities. Operated by the Japanese during the war, the plant suffered considerable damage to equipment, Mr. Hinshaw said.

A native of Myersdale, Pa., Mr. Wiland joined Goodyear in 1924 as a file clerk. During the war, after holding several supervisory posts in Akron, he was made assistant superintendent of production planning at the government's powder-bagging plant in Charlestown, Ind., operated by Goodyear Engineering Corp. He returned to Akron two years ago as a buyer in the purchasing department.

Russell A. Spoonamore has been appointed vice president in charge of production at the Goodyear factory near Havana, Cuba. He succeeds Marvin A. Ryan, who will transfer to Goodyear's larger factory in Sao Paulo, Brazil, as plant manager. Larry Coffin, present plant manager in Brazil, will return to the Goodyear-Akron organization on a new assignment, Mr. Hinshaw explained.

A native of Cleveland, Mr. Spoonamore joined Goodyear's production training squadron in 1930 after graduating from Ohio Wesleyan University. From 1934 to 1938 he did development work at Goodyear's plant in Wolverhampton, England, and in 1940 he became the company's factory representative in India. He returned to Akron last year.

Mr. Ryan opened the Goodyear plant in Cuba a year ago. Previously he had been a division superintendent at Goodyear's Brazilian factory since 1941. He joined the company in 1933 at Los Angeles, later transferring to Akron as a compounder.

Arden R. Hacker has been named manager of mechanical goods design at Goodyear's plant in Hurlingham, Argentina. A native of Sandusky, O., Mr. Hacker came to Goodyear in 1935 after receiving an engineering degree from Ohio State University. He started in Akron on the company's production training squadron and then worked three years for Goodyear Tire & Rubber Export Co., including an assignment in Columbia and Venezuela. During the war Mr. Hacker served in both the European and Pacific theaters as a major in the field artillery. Since his return to Akron a year ago he has been a designer in Goodyear's mechanical goods division.

John H. Moss is now manager of storage battery and brake lining sales. Mr. Moss, assistant manager of the department for two years, succeeds E. R. Hardy, resigned. Native of LaCrosse, Wis., and a graduate of the University of Wisconsin, Mr. Moss started with Goodyear in 1934 as store manager in St. Paul. He had previously been in the tire retail and wholesale business in Minneapolis and was associated later with a rubber manufacturer in retail stores. Except for a period in 1939, when he was retail store supervisor, Mr. Moss has been affiliated with battery and brake lining division during his entire Goodyear service.

Appointment of John M. Bastion as Goodyear Tire & Rubber Export Co.'s sales representative, with headquarters in San Francisco, has been announced by A. G. Cameron, vice president and general manager of Goodyear Foreign Operations. Bastion will be in charge of the company's complete line of export items, including tires, tubes, mechanical goods, chemical and shoe products. A native of Vinton, La., Mr. Bastion is a mechanical engineering graduate of Texas A. & M. University. He came to Goodyear in 1938 on the company's production training squadron. Early in the war he became a gas mask engineer for Goodyear, but later joined the army air force and achieved the rank of captain as a bomber pilot. Since his return from military service he has been associated with Goodyear Export's mechanical goods department in Akron.

J. C. Thomas, vice president of Wingfoot Homes, Inc., recently announced a number of supervisional changes affecting personnel of Goodyear's Litchfield Park, Ariz., subsidiary, following transfer of executive personnel to the new Homes plant in East St. Louis, Ill., last month. Ralph Nance steps up from the position of general foreman to that of superintendent; while Arthur Steger becomes department foreman, and Bob Estes, works accountant. W. J. Smelser has been transferred from Arizona to East St. Louis as department foreman.

Production of the first tire at Goodyear's new factory at Uitenhage, South Africa, was announced last month. Manufacturing steps relative to building this tire were witnessed by Goodyear executives and local South African government officials, according to a telegram sent the Akron company by V. D. Follo, general superintendent of the new plant. Formal opening of the plant will take place in June, A. G. Cameron, vice president and general manager of Goodyear foreign operations, stated, and he also said that several Goodyear officials from the home office would attend the celebration. The new factory, one of the most modern built, consists of a tire and tube plant and a separate unit devoted exclusively to the manufacture of industrial rubber products.

Among veterans who recently completed long service with Goodyear are: Carl H. Immegart, field represntative in Cincinnati, 30 years; and B. M. Stadden, credit manager at Chicago, P. D. Winings, truck tire representative at Oklahoma City, John A. Lawrence, of the manufacturers sales division at Detroit, and Carl Davidson, manager of Goodyear Export's Caribbean division, all with 35 years' service.

New Tires Announced

A new premium passenger-car tire constructed of all-nylon cord which gives the tire 60% more strength than the best cord previously used, was recently announced by P. W. Litchfield, Goodyear board chairman. Called the Double Eagle, the new tire is the postwar version of the company's established premium line suspended during the war. Added qualities are gained by building the casing with six complete plies of nylon. This construction substantially lightened the tire's weight, while giving the tire far greater strength and much higher heat resistance than those of other types of tires now in use. Because of material scarcity, the all-nylon tire will be manufactured for the present in the larger car sizes only, including 7.00-15, 7.00-16, and 7.50-16. With production currently limited, dealers will be supplied on an allocation basis at the outset. Introduction of the six nylon plies in construction of the new tires means a weight saving which permits use of a 33% thicker non-skid tread design, with attendant benefits of greater safety and longer wear.

View of World's Largest Truck Tire Building Room in Goodyear's Plant One at Akron

A tire almost eight feet tall and weighing close to a ton is now in volume production at Goodyear's Akron plant. Designed to meet the requirements of large construction machinery manufacturers, it marks the second time within the past year that Goodyear has been called upon to increase the size of its earthmover tires. The new giant casing has a carrying capacity of approximately 16 tons and will be used on large earthmoving units capable of carrying 20 to 25 cubic yards of earth on each haul. According to company development engineers, there is enough rayon cord in the tire to reach more than 125 miles, and more than half a ton of rubber is required to build one casing. Tires such as this newest 30.00-33 casing are designed for vehicles used on highway and airport construction, levee and dam projects, and in the mining of coal and ores.

The world's largest truck tire room, located at Goodyear's Plant One in Akron, is one of the main reasons for the tire industry's outstanding performance in satisfying the war-created shortage of truck tires in record time. This tire room extends for a quarter-mile and has a rated capacity of 10,000 units per day. Recently completely modernized, it is now operating at new peaks, according to president Thomas, who stated that the 134 tire building machines concentrated in this single room are valued at more than a million dollars. These machines are devoted exclusively to the production of truck tires in sizes from seven to 14-inch cross-sections, a range which covers the greatest bulk of sizes in common usage. Other large tires, including earthmovers, airplane and farm tires, are made in other departments and plants.

Modernization of the plant included new arrangement and placement of machinery, installation of scientifically planned lighting that is practically shadowless, and new flooring for a considerable portion of the approximately 170,000 square feet of floor space. All equipment, including the conveyer lines and the hauling trucks is operated electrically, with some 350,000 watts of electricity required for the department. The conveyer system used to carry tires from the building machines to the vulcanizing pits is 3,750 feet in length. In an average working day more than 500,000 pounds of compounded rubber, fabrics, and steel wire beads are converted into truck tires in this one room. Currently in operation 24 hours daily, the room requires some 1,600 workers to provide the servicing and tire building functions.

The industry as a whole is now producing truck tires at a rate that would reach the 18-million total for 1947, as compared with wartime productions of 16,354,000 truck tires in 1945 and 15,758,000 tires in 1946. Actual production is not expected to reach that figure since the truck tire shortage is rapidly being relieved, and output will be reduced to a more normal level some time during the year. However, Mr. Thomas pointed out, the trucking industry faces continued growth and expansion for many years to come, which fact will be reflected in future rates of truck tire production.

Huge, complex belt conveyer systems, some of which run for miles cross-country and underground, can now be duplicated in exact miniature for the first time. This engineering novelty is the creation of Chester F. Smith, Goodyear belt engineer, who is shown with one of his models in the accompanying photograph. He spent two years' spare time designing and building the tiny components in his home workshop, and won the company's maximum suggestion award of $1,500 for his ingenuity. Constructed to one-sixteenth scale and powered by a small 60 r.p.m. motor, the minute parts can be used to reproduce in miniature all types of belt conveyers. Equipment includes idlers, framework, belting, counter-weights, and a small stand of tires to cushion the loading impact. According to E. W. Stephens, manager of Goodyear belting sales, the model is ideal for engineering research. He stated that the models will also be used for testing new belt designs, sales demonstrations, and as visual aids in training field representatives. Mr. Stephens said further that the equipment was directly responsible for the first successful two-way conveyer belt recently developed by the company.

Chester F. Smith, Goodyear Belt Engineer, with His Model Belt Conveyer System

What is probably America's most unusual suspension bridge, designed solely to support a belt conveyer system used in a coal mining operation, is under construction at Gary, W. Va. The belt, built and designed by Goodyear, will carry refuse from a central cleaning plant in a valley to a spoil pile over a hill 1,500 feet away and 486 feet above the valley floor. Two-thirds of the route is over the suspension bridge. An unusual feature of the bridge, according to W. C. Winings, manager of Goodyear's mechanical goods division, is the use of huge steel cables. Other features of the bridge include

self-alining idlers on which the 30-inch belt travels and the use of three towers to support and anchor the weight-carrying catenary cables. The 3,000-foot length of the belt itself, built especially for this operation, is an advance in design, according to W. P. Hallstein, company assistant manager of belting sales. This length was made possible by reinforcing the carcass of the belt with steel cables. When operating at capacity, transporting 350 tons of material hourly, the belt will exert a pull on a head pulley shaft and bearings of 30,000 pounds. Belt speed is 400 feet per minute.

A new wartime use for rubber was found in Java. Elaborate breastworks and pillboxes, built and cleverly camouflaged by the Japanese during their occupation of the Dutch East Indies, were constructed of bales of natural rubber. This rubber is now being recovered, according to a report received by company officials from Mr. Hochberg. Some of the rubber used in these fortification came from Goodyear's Wingfoot plantation in nearby Sumatra. An average-size bale of rubber weighs 250 pounds and is 20 inches thick. Its effectiveness against shellfire was never tested: the Japs surrendered before the Allies had occasion to invade Java.

Seiberling Rubber Co., Akron, according to President J. P. Seiberling in the annual report to shareholders, by its expansion program will have a postwar capacity more than double the prewar rate, and the last third of this program is expected to be completed this year. Additions to plant and machinery were made at the company's heel and sole factory at Carey, O. But the proposed new tire plant at Garland, Tex., was postponed "because rapidly mounting reconversion and machinery costs, delays, and excessive cost of financing the project, made it impractical last year, Mr. Seiberling explained. Discussing outlook for 1947, Mr. Seiberling believes that the nation's pent-up demand for rubber goods will be satisfied before the year's end and that the industry will be able to commence rebuilding of normal inventories. He predicted further increases in total sales volume for 1947 and a year of "greatest activity" for his company.

Pharis Tire & Rubber Co., Newark, recently entertained with a three-hour conducted tour of the plant The Professional Engineers Society of Central Ohio. Ralph Reel, vice president in charge of research and development for the company, acted as host.

Furber Marshall, Pharis president, has been elected to the boards of the Newark YMCA and of the Newark Baseball Club.

Ernest A. Moller, sales manager of the rubber company, has been reelected secretary of the Cycle Parts Association, a section of the Bicycle Institute of America.

Fifteen bicycle races will be included in the Fourth Annual Pharis Cyclecade to be held in Newark on May 18, with more than $1,000 in merchandise prizes to be awarded winners. Three races will comprise the Central States Championship, sanctioned by the Amateur Bicycle League of America and expected to attract outstanding amateur bike riders from all over the Midwest, according to Hynes Pitner, Pharis vice president in charge of sales. The remaining 12 races will be for boys and girls between three and 16, who live in the Newark area.

Karl N. Carter

The Ohio Rubber Co., Willoughby, has appointed Karl N. Carter manager of general sales, exclusive of the automotive and other accounts served by the Detroit office of the company. Mr. Carter, an alumnus of Ohio State University, was associated with two large rubber manufacturers for many years. Throughout the war he specialized in rubber-to-metal adhesion and molded rubber parts in connection with sales and development work on government projects. Following V-J Day, Mr. Carter returned to the New York headquarters as manager of the service merchandising department of the rubber company with which he was associated before and during the war.

Manufacturer of a wide diversity of mechanical molded and extruded rubber products including rubber-to-metal adhesion processes, Ohio Rubber has factories in Willoughby, O., Conneautville, Pa., and Long Beach, Calif. Branch offices are located in New York, Boston, Detroit, Chicago, Indianapolis, and Cleveland.

General Tire Promotes Several

Three major changes in the executive sales organization of The General Tire & Rubber Co., Akron, were announced last month by L. A. McQueen, vice president in charge of sales. To keep pace with the expanded sales demands of the five-state St. Louis marketing area, the company has established a new St. Louis branch and has promoted John S. Walker from Memphis manager to head this new operation. Taking over the Memphis assignment is J. G. Taylor, former assistant eastern division manager. The third change finds Richard F. Blundin, assuming the managerial reins of the Philadelphia branch organization under the direction of H. A. Bellows, eastern division head.

Mr. Walker's 19-year experience with General Tire includes virtually all phases of the business—from auditing to sales management—and this experience qualified him for the task of organizing the new St. Louis office, which will serve one of General Tire's largest markets. The St. Louis branch territory includes portions of Kentucky, Tennessee, Arkansas, Illinois, and part of Missouri.

Mr. Taylor will direct the sales operations in the territory including portions of Tennessee, Alabama, Mississippi, Kentucky, Louisiana, Arkansas, and Oklahoma. He will headquarter at the company's new branch facilities at Memphis, 656 Huron Ave., Memphis, Tenn.

Mr. Blundin has been in sales work since 1926. He came to General Tire after 12 years in sales with the Scott Paper Co.

At the same time appointment of John L. Mead as director of industrial relations for the company was announced by A. W. Phillips, assistant to the vice president in charge of operations. Mr. Meade has been with General for 19 years and has acted in many executive capacities since joining the company direct from Antioch College in 1928. Mr. Mead served with production control from 1928 through 1930; he did efficiency work in branches and stores until 1935, and after a three-year period in factory production was named production superintendent of General's mechanical goods division at Wabash, Ind. He returned to Akron in 1941 to take charge of methods.

Later in the month Russell W. Klar was made assistant manager of the traffic department. He is a ten-year man and during the war was a lieutenant in the Transportation Corps.

Robert J. Mullin becomes chief clerk of the traffic department. He has been with General 11 years, including war service as a chief warrant officer with the Transportation Corps.

Robert Read was named general foreman of stock preparation and passenger tire, industrial, and light truck tire building. Other jobs held by Mr. Read at General since 1933 include mechanical goods, airbags, mill room, and five years of tire designing. He was a lieutenant commander in the Navy during the war.

Appointment of Jack Anderson as director of public relations for the General Tire & Rubber Co. of California was announced April 9 by D. A. Kimball, vice president. Mr. Anderson will direct public relations, publicity, and advertising for all divisions of the company and have headquarters at the Aerojet Engineering Corp., Azusa, Calif. An affiliate of General Tire & Rubber Co., Aerojet is one of the largest manufacturers of assisted take off rockets in the world. Mr. Anderson brings to his new appointment a combination of more than 20 years in the aviation industry and ten years of experience in the public relations field, including work for Douglas Aircraft, Curtiss-Wright Corp., Republic Aviation Corp., Arizona Airlines, Inc., and Arizona Helicopter Service. He will retain his present offices in Los Angeles and Santa Monica, continuing to serve his aviation, automotive, and trade association clients, in addition to his new duties for General Tire.

MIDWEST

Michigan Chemical Corp., St. Louis, Mich., has elected A. M. Byers vice president in charge of magnesia sales. He had been managing sales of the corporation's magnesia since 1943. Previously he had been vice president of General Magnesite & Magnesia Co., and from 1901 to 1916 had been with Ehret Magnesia Mfg. Co.

Michigan Chemical specializes in manufacturing synthetic magnesium oxides and hydroxides, using as its basic raw material source Central Michigan's pure natural brine deposits.

Hires Container Engineer

The Union Pacific Railroad Co., Omaha, Neb., after a year of trial, has termed highly successful an innovation in carrier operation, the services of a container engineer. Believed to be the first railroad to add a packaging expert to its loss and damage prevention organization, Union Pacific hired Warren R. White, a container engineer of 20 years' experience, as an additional measure toward counteracting the ever-increasing burden of freight loss and damage payments, payments which during 1946 totaled about 80 to 100 million dollars in the United States. Despite technological progress in virtually every field of railroading, the freight loss and damage curve has moved steadily upward, owing largely to wartime shortages of competent packagers in industry, inferior packaging materials, shortages of adequate help, and the establishment of new businesses each with its own peculiar packaging problems.

The course taken by Mr. White was direct and simple and productive of results. The scope of activity was broad, covering every type of commodity, and attention sooner or later was given to every known type of container, including crates, fiberboard boxes, wooden boxes, drums, bales, and sacks. The first step in the program is investigation of container failure reports. Much of this observation is personal on the part of Mr. White, but the railroad has also noted an increase in efficiency on the part of its local freight inspectors and freight service inspectors as a result of working with the container engineer. Next in the program comes analysis of failures. With the container flaw uncovered, the engineer prepares a report to O. J. Wullstein, the railroad's general freight claim agent. To date, hundreds of these reports have been filed, and action has been taken on them. Based on these reports, letters are written to the parties concerned informing them of the damage, giving the analysis of the failure, and suggesting corrective measures. If warranted, this information is given to the shipper in person by the engineer. Although it is not possible to appraise this program in dollars and cents, it is known to have prevented recurring damages which could have totaled many thousands of dollars, in addition to having effected savings in scarce commodities, eliminated shipment delays, and created additional business for the railroad.

Baldwin Rubber Co., Pontiac, Mich., demonstrated by experience how a changeover from Class A to Fiberglas insulation can frequently enable electrical equipment to stand up under unusually severe operating conditions. Angus McDonald, chief engineer for the company, was confronted during the war period with the necessity of obtaining 750 h.p. from a 500 h.p., 120 rpm., 5,000 volt synchronous motor employed to drive two Banbury mixers originally used for natural rubber. For this purpose 500 h.p. was sufficient, but when GR-S had to be mixed, 750 h.p. was required to achieve the same output and efficiency. There was no room in the plant for a 750 h.p. motor, and no such motor was available. The only solution appeared to be dropping one of the Banburys and reducing output by nearly one-half at a time when maximum production was urgent. Mr. McDonald however, arrived at a happier solution, that of replacing the motor's original Class A insulation with a Fiberglas rewind. The rewind motor has been in operation almost three years without failure. During the war it operated under a 750 h.p. load for 12 hours each day, seven days a week.

Promotions at Monsanto

Walter A. Vahle has been appointed assistant to the director of purchases and traffic of Monsanto Chemical Co., St. Louis, Mo., for assignment to special duties effective April 1, and Harry F. Klocker has been made general traffic manager to succeed Mr. Vahle, who had held the position since 1922. Mr. Klocker joined Monsanto in 1936 and has served as assistant traffic manager since that time.

Frederic L. Matthews has been made associate director of research of Monsanto's Merrimac division at Everett, Mass., and Dr. Matthews' former post of coordinator of petroleum additives in Monsanto's organic chemicals division will be filled by Harry W. Faust, a group leader in petroleum research in the division. This post goes to J. F. Palmer, a research chemist in the petroleum chemical research group.

Dr. Matthews came to Monsanto in 1939 as a chemist in the St. Louis research department. He became a group leader in the department in 1943 and in the same year was made coordinator of petroleum additives. A native of New York, N. Y., Dr. Matthews received an A.B. degree in 1936 and a Ph.D. in 1940 from Columbia University. He is a member of Phi Lambda Upsilon, Sigma Xi, the American Chemical Society, and the Society of Automotive Engineers.

Mr. Faust joined Monsanto in 1929 as an analyst in the St. Louis research department, became a research chemist in 1931, and was a group leader in petroleum chemical research since 1937. A native of Kearsarge, Mich., he received a B.S. degree from the University of Michigan in 1929. He also belongs to the A.C.S.

Dr. Palmer, with the company since August, 1941, began as a research chemist in the St. Louis research department, was on military leave of absence from April, 1942, until January, 1946, in the Army Chemical Warfare Service, and returned to the St. Louis research department in January, 1946, as a research chemist. A native of Cedar Rapids, Iowa, Dr. Palmer received an A.B. degree from Coe College in 1937 and a Ph.D. from Iowa State College in 1941. He is a member of Alpha Chi Sigma and the A.C.S.

Construction involving $50,000,000 for new facilities centered on the production of new postwar products is in the engineering and planning stages and more than $22,000,000 in construction is already under way at Monsanto, Board Chairman Edgar M. Queeny told the annual stockholders' meeting on March 25.

Mr. Queeny also said that the largest portion of the postwar program consists of facilities for products which are either wholly new or relatively new to the company.

"Only a small amount," he explained, represents additional plants for our old line products except as they form raw materials for newer ones."

Chairman Queeny also reported that more than 99% of the 64,000 shares of cumulative preference stock, Series A, called for redemption on March 25, had been converted into shares of the company's common stock on a basis of two shares of common for each share of preference stock. He added that, in addition, holders of more than 15,000 shares of the uncalled preference stock elected to convert voluntarily, thus reducing the outstanding preference stock below $24,000,000.

Fredrick M. Eaton, partner in the New York law firm of Shearman & Sterling & Wright, and former general counsel of the War Production Board, has been elected to Monsanto's Board. He succeeds the late Theodore Rassieur, an officer of Monsanto from 1910 until his death last November and a director of the company since 1921.

More Philblack Coming

Phillips Petroleum Co., Bartlesville, Okla., in its recent annual report to shareholders revealed that last year production of Philblack, a carbon black made from liquid petroleum feed stocks instead of from natural gas, totaled 78 million pounds, and plant capacity is now being enlarged to 105 million pounds annually. Another plant, soon to be completed, will produce from oil 36 million pounds annually of still a different type of Philblack suitable for compounding with both synthetic and natural rubber and having qualities said to be similar to, but in certain respects superior to conventional channel black manufactured from gas. Phillips Petroleum, incidentally, is one of the largest suppliers of natural gas for the manufacture of channel-type carbon black.

The report further states that world demand for the various grades of carbon black is in excess of supply; while stocks are at a very low level. Market prices, moreover, are appreciably higher than a year ago.

An important chemical activity of the company, according to the annual report, is its operation for the government of one of the largest and lowest-cost plants of its kind producing butadiene for making synthetic rubber. This plant is running at its recently enlarged capacity of 56,200 tons annually and will probably continue to do so for some time, as national demand for synthetic and natural rubber continues at a high level, and present stocks on hand provide for less than four months' supply.

In order to centralize certain research pilot-plant and semi-commercial units for proving laboratory developments prior to full-scale commercial operation, Phillips Petroleum has acquired a 160-acre site for this purpose adjacent to Bartlesville.

Wheelco's New Arrangements

Wheelco Instruments Co., Chicago, Ill., maker of electronic instruments for measurement and control of industrial processes, recently consummated an arrangement whereby Wheelco instruments will be manufactured and marketed throughout the United Kingdom by Ether, Ltd., Birmingham, Eng. The extensive new line will be a combination of standard Wheelco models such as Capacitrols, Potentiotrols, and Flame-otrols operating electronically together with Ether-made indicating, recording, optical and radiation pyrometers, servo mechanisms, and electrically and hydraulically operated valve gears. All the Wheelco English patents and rights have been transferred to Ether, Ltd., and plans have been made for production as rapidly as the necessary tooling can be completed. The instruments will be sold under the name of Ether-Wheelco Controls. Arrange-

ments were made between Chas. L. Saunders, Wheelco executive vice president and H. A. Stevenson, managing director of Ether, during the latter's visit to this country. Mr. Stevenson, one of the founders of Ether, Ltd., in 1923, has been associated with electronic research since 1911, having been connected with Marconi Wireless & Telegraph, Ltd.; Kelvin, Bottomly & Baird; and Cambridge Instrument Co.

Wheelco has named Elmer Schneider to a newly created position, vice president and director of engineering. In this capacity Mr. Schneider will take complete charge of all engineering activities of the company, including inspection and approval of quality standards.

Joseph A. Reinhardt will become plant manager and assume responsibility for all manufacturing operations. Mr. Reinhardt comes to Wheelco with a background of 25 years in production and engineering work.

National Sporting Goods Association recently opened new offices at 809 Continental Bldg., St. Louis, Mo. John H. Hatton is executive secretary of the organization.

NEW ENGLAND

Davol Rubber Elections

At a recent meeting of the board of directors of the Davol Rubber Co., Providence, R. I., Ralph D. Berry was re-elected vice president and secretary. Camilo Rodriguez, formerly assistant secretary and assistant treasurer, was elected vice president and assistant treasurer; Richard N. Carr, formerly assistant factory manager was elected assistant secretary and also made production manager; Leon R. Nodine, formerly factory manager, was elected vice president in charge of production; Robert B. Little, formerly sales manager, was elected vice president in charge of sales; and John A. Clemens, formerly service manager, was elected vice president in charge of distribution.

Announcement of these elections was made by Ernest I. Kilcup, company president and treasurer. Simultaneously came word of the following promotions: Jesse Little, formerly plant superintendent, now factory manager; E. L. Hanna, formerly chief chemist, now director of laboratories. P. A. Raiche is experimental engineer; W. A. Fearney was appointed plant engineer, and R. D. Whalley was named advisory plant engineer.

Hodgman Rubber Co., Framingham, Mass., recently elected as president Max I. Woythaler, general manager since 1931. He succeeds A. H. Wechsler, now chairman of the board. At the same time Purchasing Agent Herbert Bremner was elected assistant treasurer. Mr. Woythaler, with the company since 1919, was elected treasurer in 1926.

Seamless Rubber Co., New Haven, Conn., has added to its sales force Roger W. Stevens. His headquarters are at San Francisco, Calif., and he will cover the Pacific Northwest territory.

FINANCIAL

American Cyanamid Co., New York, N. Y., and subsidiaries. For 1946: consolidated net income, $8,692,881, equal to $3.55 a common share, against $6,213,054, or $2.34 a share, the year before; net sales, $178,952,811, a new high, against $159,053,405.

American Hard Rubber Co., New York, N. Y., and subsidiary. For 1946: net income, $207,686, equal to $10.73 each on 19,344 shares of $7 preferred stock on which dividend arrears were $5.25 a share at the year-end; for 1945, net loss, $159,168; net sales for 1946, $13,624,977, against $11,959,276 in 1945; taxes $219,753 against $212,158; current assets, $4,827,367, against $4,053,089; current liabilities, $1,935,476, against $1,221,072; inventories, $2,177,468, against $1,623,950.

American Wringer Co., Inc., Woonsocket, R. I. For 1946: net profit, $602,073, equal to $2.17 a share, against $1.78 a share the year before.

Baldwin Locomotive Works, Philadelphia, Pa. For 1946: net profit, $3,802,738, against $3,769,948 in 1945.

Belden Mfg. Co., Chicago, Ill. For 1946: net profit, $765,311, equal to $2.62 each on 291,460 capital shares, against $402,403, or $1.52 each on 265,300 shares, in 1945.

Brunswick-Balke-Collender Co., Chicago, Ill., and subsidiaries. For 1946: net profit, $1,654,288, equal to $3.38 a common share, against $1,018,503, or $1.98 a share, in the preceding year.

Carborundum Co., Niagara Falls, N. Y. For 1946: net earnings, $2,568,726, equal to $5.04 each on 509,265 common shares, contrasted with $1,571,207, or $3 a share, in the preceding 12 months; sales, $37,068,805, against $40,416,337.

Columbian Carbon Co., New York, N. Y. For 1946: net income, $5,307,861 (a record), equal to $3.29 a share, against $3,352,008, or $2.08 a share, in 1945; sales, $34,363,005, against $27,244,318.

Eagle-Picher Co., Cincinnati, O., and subsidiaries. Year ended November 30, 1946: net profit, $2,102,196, equal to $2.36 a common share, against $1,392,412, or $1.56 a share, in the preceding fiscal year; net sales, $40,989,398, against $1,290,803.

Electric Storage Battery Co., Philadelphia, Pa., and subsidiaries. For 1946: consolidated net income, $3,283,510, equal to $3.62 each on 907,810 common shares outstanding, contrasted with $1,999,794, or $2.20 a share, in the preceding 12 months; sales, $55,720,016, against $68,345,743.

Flintkote Co., New York, N. Y. For 1946: net profit, $3,710,723, against $1,643,285 in 1945; sales, $52,579,605, against $37,023,415.

Dayton Rubber Mfg. Co., Dayton, O., and subsidiaries. Year ended October 31, 1946: net profit, $2,101,524, equal to $4.43 a common share, against $431,466, or 75¢ a share, in the previous 12 months.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. For 1946: net income, $112,620,000, equivalent, after preferred dividends, to $9.44 a common share, compared with $77,521,000, or $6.29 a share, the year before; sales, $648,703,000 (a new high), against $611,256,000; taxes, $72,153,000, against $89,407,000; current assets at the year-end, $335,354,608, current liabilities, $74,986,597.

General Cable Corp., New York, N. Y. For 1946: net income, $3,045,421, equal, after preferred dividends, to $1.13 each on 1,898,614 common shares outstanding, compared with $2,569,543, or 44¢ a share, the previous year; current assets at the year-end, $27,922,217, against $30,275,850; current liabilities, $6,754,142, against $6,967,630.

General Electric Co., Schenectady, N. Y. For 1946. Net income, $43,039,589, equal to $1.49 a common share, compared to $56,540,555, or $1.96 a share, in 1945; net sales, $679,078,216, against $1,298,221,886; current assets, $534,431,518, against $622,659,634; current liabilities, $184,541,717, against $360,284,102.

General Tire & Rubber Co., Akron, O., and subsidiaries. Year ended November 30, 1946: consolidated net income, $5,734,955, equivalent to $9.05 a common share, contrasted with $1,607,543, or $2.20 a share, in the preceding 12 months; net sales, $105,883,559 (a new high), against $87,095,111; current assets, $43,275,073, current liabilities, $22,28,038.

Hewitt-Robbins, Inc., Buffalo, N. Y. For 1946: net income, $471,452, equal to $1.70 a capital share, against $641,000 the year before; net sales, $15,426,415, against $14,403,000.

Intercontinental Rubber Co., Inc., New York, N. Y., and subsidiaries. For 1946: net income, $135,629, against $398,476 in 1945; net sales, $418,242, aganist $1,062,051; current assets, $1,797,851, against $2,123,063; current liabilities, $204,579, against $198,110.

Johnson & Johnson, New Brunswick, N. J., and subsidiaries. For 1945: net income, $8,204,717, equal to $8.71 each on 905,445 common shares, compared with $3,058,279, or $3.05 each on 896,925 shares, in 1945.

I. B. Kleinert Rubber Co., New York, N. Y., and subsidiaries. For 1946: net profit, $387,329, equal to $2.40 a share, against $236,848, or $1.46 a share in 1945.

Monsanto Chemical Co., St. Louis, Mo. For 1946: net earnings, $10,084,149 (a new high), equal to $2.37 a common share, contrasted with $5,318,003, or $1.16 a share, in 1945; net sales, $99,590,790 (also a record) against $95,339,391; inventories, $17,984,778, against $14,397,944.

National Lead Co., New York, N. Y. For 1946: consolidated net income, $9,677,084, equal, after preferred dividends, to $2.46 each on 3,090,664 common shares outstanding, compared with $6,538,508, or $1.45 a share, a year earlier; net sales, $167,447,243, against $167,562,928.

National Rubber Machinery Co., Akron, O. For 1946: net profit, $333,941, equal to $2.17 a share, against $614,503, or $3.99 a share, in 1945.

O'Sullivan Rubber Corp., Winchester, Va. For 1946: net profit, $251,333, against $328,386 the year before.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. For 1946: net income, $22,625,151, equal to $4.60 each on 4,916,987 shares outstanding, compared with $22,571,509, or $4.59 a share, the year before.

Pittsburgh Plate Glass Co, Pittsburgh, Pa. For 1946: net income, $17,061,099, equivalent to $1.92 each on 8,899,622 shares of $10 par value stock, contrasted with $13,539,160, or $1.53 each on 8,852,244 shares, the year before; sales, $184,660,940, an all-time high and 28% higher than the 1945 figure of $144,173,052; provision for taxes, $14,000,000, against $8,047,165.

Raybestos-Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. For 1946: net profit, $1,651,187, equal to $2.63 a share, against $1,533,968, or $2.44 a share, a year earlier; net sales, $51,985,801, against $49,633,202; taxes, $2,493,520, against $3,402,192; inventories, $7,848,361, against $6,614,277; reserve for contingencies, $3,079,502, unchanged; current assets at year-end, $20,209,418, against $19,214,843; current liabilities, $5,830,957, against $4,116,804.

Seiberling Rubber Co., Akron, O. For 1946: net income, $1,124,141 (a record), equal to $3 a common share, contrasted with $504,882, or $1.33 a share, the year before; net sales, $30,516,556, against $26,228,523; current assets, $9,691,338, current liabilities, $3,569,359.

Skelly Oil Co., Kansas City, Mo. For 1946: net income, $10,104,765 (a new high), equivalent to $10.30 a share, against $8,531,274, or $8.69 a share, in 1945.

Sun Chemical Corp., New York, N. Y. For 1946: net profit, $1,464,706 (a record), equivalent to $1.15 a common share, contrasted with $770,441, or 71¢ a share, in the preceding year; consolidated net sales, $29,045,533 (also a record), against $17,546,942.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. For 1946: consolidated net income, $14,726,551, equal to $4.17 a common share, against $15,666,543, or $4.44 a share, in 1945.

Union Asbestos & Rubber Co., Chicago, Ill. For 1946: net income, $532,352, equal to $1.12 a share, against $537,429, or $1.13 a share, in 1945; net sales, $5,139,138, against $8,022,781.

Union Carbide & Carbon Corp., New York, N. Y. For 1946: net income, $57,205,351, equal to $6.10 a common share, compared with $37,889,526, or $4.08 a share, in the previous year; sales, $414,988,315, against $481,521,284; inventories, $91,749,094, against $80,067,182.

United Elastic Corp., Easthampton, Mass., wholly owned and subsidiaries. For 1946: net income, $2,192,392, against $567,148 a year earlier.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. For 1946: net income, $1,508,097, equal to $5.04 a share, against $636,136, or $2.13 a share, in 1945.

New Incorporations

Bettis Rubber Co., Los Angeles, Calif., Capital $150,000. Directors: B. H. and H. C. Barnes, San Marino, and H. M. Taylor, Los Angeles, both in Calif. Represented by Brown, Berry & Rogers, 458 S. Spring St., Los Angeles, Calif.

Golf Professionals Supply Corp., New York, N. Y. Capital stock, 500 shares, no par value. Directors: S. Newborg, I. Minkin, and D. W. Helfat. To conduct a business in rubber products, etc.

Wise Products, 4225 N.W. St. Helen's Rd., Portland, Oreg., has appointed Herbert E. Abel sales manager. Mr. Abel, an expert in industrial specialties and a former captain in the Army Quartermaster Corps, will particularly push the sales and distribution of Fender-Float, a synthetic rubber boat fender now distributed on a nation-wide scale.

OBITUARY

John E. Congdon

JOHN ELLIOTT CONGDON, former supervising engineer of the United States Rubber Co., with which he had been associated for 32 years, died March 12 at Providence, R. I. He had been in business for himself as a consulting engineer in Providence, at the time of his death.

He was born in Fall River, Mass., on May 27, 1876, and in 1899 was graduated from the Massachusetts Institute of Technology. The deceased was a member of the Central Congregational Church, the Rhode Island Historical Society, and the Knights Templars.

Mr. Congdon is survived by his wife, three sons, and a grandson.

Funeral services were held March 14 at the Irving H. Drabble Chapel in Providence, and burial was in Oak Grove Cemetery, Fall River.

Herbert F. Whalen

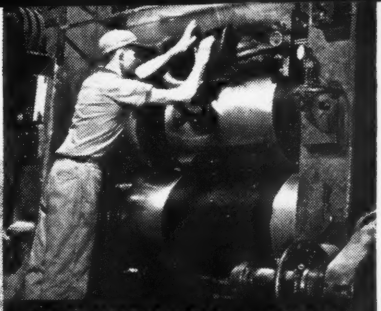
HERBERT F. WHALEN, group leader of lacquer research at Monsanto Chemical Co.'s Merrimac Division plant, Everett, Mass., died unexpectedly at the plant on April 9. In recent years Dr. Whalen was largely responsible for the successful basic development of new airplane finishes now gaining wide use.

A native of Everett, Dr. Whalen attended Boston University graduate and undergraduate schools and received his Ph.D. degree from Princeton University in 1924. Immediately after graduation he entered the research laboratory of the Merrimac plant, then the Merrimac Chemical Co. In 1927 he was assigned to lacquer research and continued in that program after Merrimac was acquired by Monsanto in 1929. Dr. Whalen was a member of the American Chemical Society and the New England Genealogical Society.

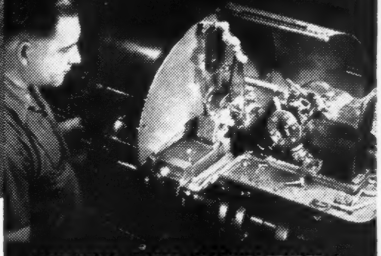
Surviving are his wife and two children.

Dividends Declared

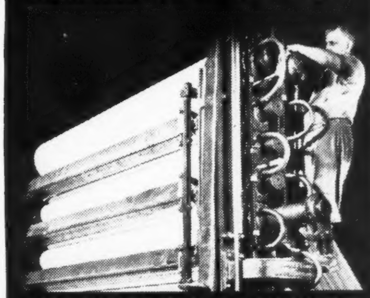
COMPANY	Stock	Rate	Payable	Stock of Record
American Wringer Co., Inc.	Com.	$0.30	Apr. 2	Mar. 15
Anaconda Wire & Cable Co.	Com.	0.50 incr.	Apr. 21	Apr. 11
Armstrong Rubber Co.	Pfd.	0.59 3/8 q.	Apr. 1	Mar. 18
Armstrong Rubber Co.	"A"	0.25 q.	Apr. 1	Mar. 18
Armstrong Rubber Co.	"B"	0.25 q.	Apr. 1	Mar. 18
Carborundum Co.	Com.	0.50 q.	Mar. 31	Mar. 14
Converse Rubber Corp.	Pfd.	0.25 q.	Apr. 10	Apr. 1
Converse Rubber Corp.	2 Pfd.	0.20 q.	Apr. 10	Apr. 1
Crown Cork International	"A"	0.40 accum.	Apr. 1	Mar. 14
Electric Storage Battery Co.	Com.	0.75 irreg.	Mar. 31	Mar. 17
Firestone Tire & Rubber Co.	Com.	1.00	Apr. 21	Apr. 5
Garlock Packing Co.	Com.	0.25 q.	Apr. 1	Mar. 20
General Electric Co.	Com.	0.40	Apr. 25	Mar. 14
General Tire & Rubber Co.	4¼% Pfd.	1.06¼ q.	Mar. 31	Mar. 21
General Tire & Rubber Co.	3¾% Pfd.	0.93¾ q.	Mar. 31	Mar. 21
General Tire & Rubber Co.	3¼% Pfd.	0.81¼ q.	Mar. 31	Mar. 21
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	1.00 q.	Apr. 1	Mar. 10
Jenkins Bros.	Com.	2.00 incr.	Mar. 28	Mar. 14
Jenkins Bros.	Non. Vot.	0.50 incr.	Mar. 28	Mar. 14
Jenkins Bros.	Pfd.	1.75 q.	Mar. 28	Mar. 24
Johnson & Johnson	Pfd. "A"	1.00 q.	May 1	Apr. 14
Link Belt Co.	Com.	0.50 q.	June 1	May 3
Mansfield Tire & Rubber Co.	Com.	0.25 q.	Mar. 20	Mar. 13
Mansfield Tire & Rubber Co.	Pfd.	0.30 q.	Apr. 1	Mar. 15
Mohawk Rubber Co.	Com.	0.50	Apr. 15	Mar. 25
Okonite Co.	Com.	1.00 q.	May 1	Apr. 16
O'Sullivan Rubber Co., Inc.	Com.	0.10 q.	Apr. 1	Mar. 15
O'Sullivan Rubber Co., Inc.	Pfd.	1.25 q.	Apr. 1	Mar. 15
Plymouth Rubber Co.	Com.	0.25 q.	May 15	Apr. 30
Rome Cable Corp.	Com.	0.25 extra	Mar. 28	Mar. 6
Rome Cable Corp.	Com.	0.25 q.	Mar. 28	Mar. 6
Rome Cable Corp.	Pfr.	0.30 q.	Mar. 28	Mar. 6



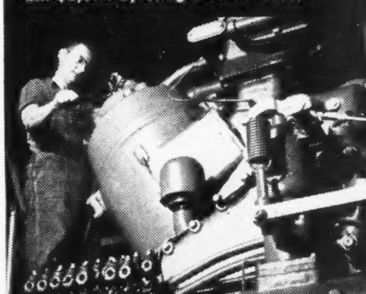
RUBBER MANUFACTURER saved $3,000 a year with a Sun Processing Aid.



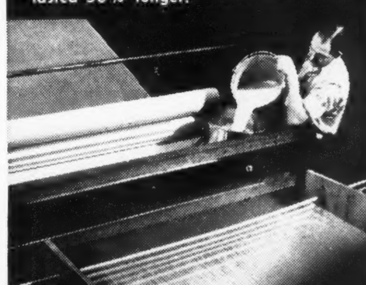
ALUMINUM PARTS MANUFACTURER increased output 43% with Sun Cutting Oil.



PAPER MILL slashed annual lubrication bill $2,874 by using a Sun Grease.



POWER PLANT found Sun Diesel Lubricant lasted 50% longer.



A TEXTILE MILL increased slashing speed 60% by adopting a Sun Processing Oil.

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion when mixed with water. Sunoco is an efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and non-ferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to develop maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel up to 550°F. Due to their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum and brass.

SUN ANTI-RUST COMPOUNDS — Petroleum base oils with chemical additives designed to prevent the rusting and corrosion of steel.

SUN PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" or fine air-borne particles of lint.

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are not so readily damaged or broken down into harmful dust when this product is used.

SUN CORDAGE OILS — Are adaptable in various formulae used by cordage manufacturers. They are selected products which are highly compatible with additives.

CIRCOSOL—2XH (Rubber Processing) — An elasticator and processing aid for GR-S particularly.

CIRCO LIGHT PROCESS OIL (Rubber Processing) —A processing aid and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber particularly. Used for GR-S to some extent.

SUNDEX 53 (Rubber Processing)—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established outstanding processing aid for footwear rubber stocks.

CIRCOMAR-5AA (Rubber Processing) —A black colored product used in reclaiming natural rubber scrap. Used also as substitute for asphalt fluxes in processing natural and GR-S rubber. Free-flowing at room temperature.

SUN LEATHER OILS—Mineral base leather oils. Used for obtaining the desired tensile strength, proper temper and a controlled moisture content. They maintain a light even color . . . mix well . . . distribute evenly.

SUN MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SPIRITS — For the thinning of paints, varnishes, and enamels. Also for metal cleaning. This product is a pure water-white petroleum solvent and is free of corrosive sulphur.

SUN WAXES — Used in packaging, sealing, coating, waterproofing and for numerous manufacturing and chemical processes.

PRODUCTS

SUNOCO

Patents and Trade Marks

APPLICATION

United States

2,414,822. **Endless Belt Reinforced with Helically Arranged Copper-Plated Steel Wire Coated with a Rubber Composition and Having an Outer Sleeve of a Loose Weave Material.** R. F. Lindsay, Detroit, Mich., and A. R. Lindsay, Cleveland, assignors to Dayton Rubber Mfg. Co., Dayton, both in O.

2,414,824-825. **Cover Assembly for a Wheel Structure.** G. A. Lyon, Allenhurst, N. J.

2,414,927. **Sanitary Pad for Beds and Cribs, Including Upper and Lower Washable Sheets, a Flannel Sheet beneath the Upper Sheet, and a Rubber Pad Adapted to Be Inserted between Flannel and Lower Sheets.** C. Chapman, Brooklyn, N. Y.

2,414,954. **Resilient Mounting for Cycle Saddles, Including a Body of Rubber or Similar Resilient Material.** H. E. Kalter, assignor to Troxel Mfg. Co., both of Elyria, O.

2,415,008. **Hose Supporter.** G. W. Harlan, Cooper County, Mo.

2,415,026. **Vehicle Suspension.** R. W. Brown, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,415,031. **Sealing Closure.** M. O. Kuhn, Cuyahoga Falls, and J. P. Sedlak, Jr., Akron, assignors to Firestone Tire & Rubber Co., both of Akron, both in O.

2,415,063. **Bendable Rubber Valve Stem.** O. W. Hosking, Monroe, N. Y., assignor to Composite Rubber Products Corp., Bridgeport, Conn.

2,415,150. **Pneumatic Mattress or the Like, Including a Plurality of Inflatable Cells Each Formed of a Flexible Hollow Body and a Relatively Rigid Base Member.** M. R. Stein, New York, N. Y.

2,415,276. **Adhesive Material Including a Barrier Layer of Polyisobutylene and an Inert Filler.** D. J. Buckley, North Plainfield, N. J., and R. L. Smith, Otego, N. Y., assignors to Industrial Tape Corp., North Brunswick, N. J.

2,415,280. **Resilient Mounting Including Movable Supporting and Supported Structures, a Resilient Cushioning Element Connecting the Structures and a Snubber of Rubber-Like Material.** H. H. Fink, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,415,290. **Tractor Tire.** J. G. Kreyer, deceased, late of Akron, O., by H. E. Kreyer, executrix, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,415,339. **In a Coffee Percolator Including an Upper and a Lower Bowl, a Seal of a Resilient-Like Material Forming a Stopper for the Lower Bowl.** W. D. Curtis, Studio City, Calif.

2,415,472. **Plastic Tube and Coupling Assembly.** J. R. Dorman, Cincinnati, O.

2,415,486. **In a Buoyant Electric Cable a Core Body of Soft Cellular Rubber Elements Combined with Rigid Members Which Define at Intervals the Outer Boundary of the Core Body, and an Envelope of Vulcanized Rubber Surrounding the Latter and Adhering to the Cellular Rubber thereof.** G. M. Hamilton, assignor to Callender's Cable & Construction Co., Ltd., both of London, England.

2,415,487-489. **Long Flexible Float.** P. Dunsheath, Abinger, assignor to W. T. Henley's Telegraph Works Co., Ltd., Westcott, Dorking, both in England.

2,415,490. **Long Flexible Float Including a Number of Rigid Buoyancy Elements between Which Is a Filing Means Consisting of Rubber Expanded in Position and Molded to the Ends of the Rigid Elements.** H. A. Macdonald, Gravesend, Kent, assignor to W. T. Henley's Telegraph Works Co., Ltd., Westcott, Dorking, both in England.

2,415,495. **Boat Including a Frame Structure and a Flexible Waterproof Covering Enclosing the Frame Structure.** M. W. Humphreys, Euclid, assignor to Ohio Rubber Co., Willoughby, both in O.

2,415,504. **In Apparatus for Molding Deeply Contoured Concavo-Convex Articles, a Concavo-Convex Diaphragm of Extensible Material.** F. J. MacDonald, Brookline, Mass., assignor to The B. F. Goodrich Co., New York, N. Y.

2,415,616. **Tire and Mounting therefor.** E. E. Wallace, Cleveland Heights, O.

2,415,652. **The Combination with a High-Voltage Cable Including a Conductor and Insulation Surrounding the Conductor, of a Grounding Conductor Consisting of a Metal Core and a Thin Annular Moistureproof Conducting Covering of Vulcanized Rubber-Like Material Incorporating Non-Corrosive Conductive Particles.** R. B. Norton, assignor to Kerite Co., both of Seymour, Conn.

2,415,660. **In a Valve Assemblage, a Plug of Resilient Material Filling a Recess Provided in a Side of a Valve Button.** L. W. Stettner, Piedmont, and K. F. Heinemann, Oakland, assignors to Victor Equipment Co., San Francisco, all in Calif.

2,415,694. **Replaceable Cell Storage Battery, Each Cell Including Terminal Posts Having a Non-Resilient Split Socket in the Upper Portion Surrounded by a Resilient Sleeve.** R. C. Isabell and J. Sawdon, both of Port Huron, Mich.

2,415,740. **Flexible Defroster to Be Mounted Adjacent a Vehicle Window.** J. Gammack, assignor to Glenn L. Martin Co., both of Middle River, Md.

2,415,763. **Relatively Hard, Rigid, and Non-Deformable Resinous Laminate.** P. P. Ryan, Trenton, N. J., assignor to St. Regis Paper Co., New York, N. Y.

2,415,815. **Balloon Including an Envelope with Upper and Lower Bulbous Portions, the Lower Portion Separating When the Envelope Is Extended Excessively, and Having Lines for Suspending a Load Secured to Its Perimeter.** L. P. Frieder, Great Neck, assignee of W. S. Finken, Brooklyn, both in N. Y.

2,415,829. **Elastic, Flexible Cover Member for a Wheel.** G. A. Lyon, Allenhurst, N. J.

2,415,846. **Oronasal Mask.** F. E. Randall, New Philadelphia, .O

2,415,875. **Flushing Tank Inlet Valve, Including a Spherical Valve Member and a Second Valve Member, Both of Resilient Material.** A. A. Greenwald, Cleveland, O.

2,415,956. **Ice Bag.** H. O. Mamaux, Pittsburgh, Pa.

2,415,983. **Shock and Vibration Insulator Including a Readily Expansible and Deformable Elastic Ring.** F. L. Yerzley, Newark, N. J.

2,416,063. **Tube Clamp.** E. P. Nicholls, North Hollywood, Calif., assignor, by mesne assignments, to Bendix Aviation Corp., South Bend, Ind.

2,416,123. **Corn Picker Roller with a Laminated Roller Body Made up of a Plurality of Flexible Disks Positioned in Side Face Engagement.** A. H. Siemen, Appleton, Minn.

2,416,124. **Corn Picker Roller Having a Laminated Roller Body Made up of Rubber Disks in Compact Relation.** A. H. Siemen, Appleton, Minn.

2,416,136. **As a Base for Flower Arrangements, Plastic Foam of High Water-Absorptive Capacity.** A. E. Arlington, Herkimer, N. Y.

2,416,137. **Mold Means Including a Flexible Pressure-Transmitting Membrane.** R. W. Auxler, J. J. Wachter, and A. Schuman, all of Wilkinsburg, assignors to Westinghouse Electric Corp., East Pittsburgh, both in Pa.

2,416,177. **Wave Guide Including a Fine Mesh Wire Fabric Tube, a Cover of Vulcanized Rubber Fitting Closely thereon, Circumferential Ribs of Rigid Material on the Cover, and a Binding Layer of Vulcanized Rubber on the Outside of the Circumferential Ribs.** D. T. Hollingsworth, assignor to Callender's Cable & Construction Co., Ltd., both of London, England.

2,416,183. **Aircraft Landing Gear.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,416,231. **Punctureproof Fuel Cell Including an Inner Layer of Elastic Gasoline Resistant Material, an Outer Layer of Oil and Friction Resistant Elastic Material, and therebetween a Layer of a Cured Polymer of Isobutylene with a Diolefin Containing a Purified Paraffinic Hydrocarbon Oil.** W. C. Smith, Elizabeth, and J. P. Haworth, Westfield, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,416,243. **Rubber Bushing for an Oscillating Bearing.** L. F. Thiry, Montclair, N. J., assignor to General Tire & Rubber Co., Akron, O.

Dominion of Canada

439,110. **In Foot Protectors for Footwear and the Like, a Casing Formed of Yieldable Material and Having a Stretchable Fluid Chamber.** H. D. Algie, Montreal, P. Q.

439,129. **Rotary Pump Including in Combination a Cylindrical Rotor with Peripheral Recesses Each Adapted to Receive a Rubber Composition Roller.** R. E. E. Jessop, West Vancouver, B. C.

439,131. **Resuscitation Apparatus.** J. Kreiselman, Washington, D.C., U.S.A.

439,153. **Cable Cleaning Device Including a Sleeve of Soft Cast Rubber.** M. Piccini, South Porcupine, Ont.

439,156. **In Manufacturing a Shim Consisting of Superimposed Layers of Aluminum Foil, Intermediate Films of Polymerized Glycerine Phthalic Acid Condensate.** H. V. Roe, Norbury Park, Surrey, England.

439,197. **Wheel Equipment for Aircraft Including a Wheel, Pneumatic Tire, and Means to Contain Fluid under Pressure to Loosen a Bead of the Tire.** Dunlop Rubber Co., Ltd., London, assignee of H. J. Butler, Coventry, Warwick, both in England.

439,203. **In a Non-Return Valve, a Flexible Tongue-Like Closure Member of Fabric Coated with Rubber or Rubber-Like Material Resistant to the Liquid in the Container.** Imperial Chemical Industries, Ltd., London, assignee of S. H. Smith and C. A. R. Sutherland, both of Wolverhampton, both in England.

439,252. **In a Figure Toy, an Elastic Element.** L. E. Hansen, Toronto, Ont.

439,259. **Signal Kit of the Package Type Including an Inflatable Balloon.** A. Y. Leslie, Detroit, Mich., U.S.A.

439,280. **As Bonding Agent in Leather Board, Heat-Cured Melamine-Formaldehyde Resin.** American Cyanamid Co., New York, N. Y., assignee of C. S. Maxwell, Old Greenwich, Conn., both in the U.S.A.

439,286. **Differential - Pressure Responsive Diaphragm Including a Sheet of Stiffener-Free Textile Completely Covered with Cured Rubber-Like Material.** Bendix Aviation Corp., assignee of F. C. Mock, both of South Bend, Ind., U.S.A.

439,305. **In a Switch, Supporting Means and an Elongated Solid Blade of Flexible and Resilient Conducting Material.** Canadian Westinghouse Co., Hamilton, Ont., assignee of C. H. Hodgkins, Fairfield, Conn., U.S.A.

439,323. **Lightweight Tube Adapted to Resist Inwardly Directed Forces, Having a Corrugated Asbestos Carcass; the Corrugation Ridges Are Treated with a Coating of Phenol-Formaldehyde Condensation Product Converted from the Liquid to the Solid Infusible State.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. G. Harding, Fairlawn, N. J., U.S.A.

439,370. **Distress Spotting Device Including a Small Captive Balloon Vividly and Phosphorescently Painted.** A. James, Vancouver, B. C.

439,373. **In a Hydraulic Accumulator for Storing Liquid under Pressure, an Inflatable Spherical Bag.** J. Mercier, New York, N. Y., U.S.A.

439,426. **In a Visor Assembly for an Automobile Window, a Sash of Rubber-Like Material.** Houdaille-Herchey Corp., assignee of G. W. Schatzman and A. P. Ferguson, all of Detroit, Mich.

439,429. **Water Stopper.** Makers of Swift Devices Co., Ltd., assignee of F. H. Hallett, both of Hamilton, Ont.

439,455. **Retractile Electric Cord.** Western Electric Co., Inc., New York, N. Y., assignee of W. T. Barrans, Towson, and P. M. Cole, Dundalk, both in Md., both in the U.S.A.

439,457. **Electric Conductor Cable.** Western Electric Co., Inc., New York, N. Y., U.S.A., assignee of Northern Electric Co., Montreal, assignee of M. Eaton, Shawinigan Falls, both in P. Q.

439,460. **In an Electronic Discharge Device, Including an Enclosing Vessel, Resilient Portions Adjacent the Wall of the Vessel; These Portions Are Joined at Their Free Ends by Expansible Cushioning Material.** Western Electric Co., Inc., assignee of Bell Telephone Laboratories, Inc., both of New York, assignee of J. E. Clark, Williston Park, both in N. Y., J. V. Domaleski, East Orange, N. J., V. L. Ronci, New York, N. Y., both in the U.S.A.

439,474. **Denture of Solid Polyurethane.** I. G. Farbenindustrie A.G., Frankfurt a. M., assignee of H. Rinke, Leverkusen-Schlebusch, and P. Weikart, Rath-Konigsforst, all in Germany.

439,485. **Form Constricting and Molding Garment with Elastic Areas.** F. A. Cohen, New York, N. Y., U.S.A.

439,504. **Extension Cigarette Holder and Ash Tray Combination, which Includes an Extension Tube.** E. J. O'Donnell, Iroquois Falls, Ont.

439,548. **Inflatable Suit.** B. F. Goodrich Co., New York, N. Y., asignee of R. S. Colley and K. C. P. Krupp, Akron, and D. H. Shook, Cuyahoga Falls, both in O., both in the U.S.A.

439,557. **Fibrous Sheet Material Including Beaten Fibers and a Copolymer of Butadiene and Styrene.** Latex Fiber Industries, Inc., assignee of A. F. Owen, both of Beaver Falls, N. Y., U.S.A.

439,571. **In a Phonograph Pick-up for Playing Lateral-Cut Recordings, an Elongate Stylus Having at One End a Resilient Rubber-Like Member as Anchorage.** Philco Radio & Television Corp., Philadelphia, assignee of L. J. Bobb, Glenside, both in Pa., U.S.A.

439,588. **Buoyant Disk Including a Main Body Portion of Expanded Closed Cell Rubber, a Protective Covering, and a Stiffening Member.** Rubatex Products, Inc., New York, N. Y., assignee of H. Pfleumer, New Brunswick, N. J., both in the U.S.A.

ANY COLOR IN ANY SHADE! . . . *that's just one of the features of this amazing Perbunan 26 NS!* As you read these other Perbunan 26 NS features, think of them in terms of product quality and profit!

- *Color stability of compounds subjected to sunlight, ultra-violet radiation, heat.*
- *Adaptability to delicate colors, including pastels.*
- *Non-staining of porcelain, enamels, plastics or fabrics.*
- *Compatibility with polyvinyl chloride in solutions, films, extrusions or molded items, whether clear or colored.*
- *Compatibility with modified phenolic type resins.*

... All this in addition to Perbunan's famous oil resistance, low temperature flexibility, heat aging characteristics and serviceability! There's much more we'd like to tell you about every one of these new features . . . much more you'll want to know. Write for more information, and let us help with your compounding problems.

THE SYNTHETIC RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

ENJAY COMPANY, INC. (Formerly Chemical Products Dept., Stanco Distributors, Inc.), 26 Broadway, New York 4, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives: H. M. Royal, Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

439,613. **Armored Marine Cable.** G. A. Johnson, Irvington, N. J., U.S.A.

439,620. **Brassiere with Elastic Fastening Straps.** L. F. Roy, Montreal, P. Q.

439,633. **Panel Including a Grille on Which Is Stretched a Resin-Impregnated and Coated Fabric.** Bendix Aviation Corp., assignee of A. A. Kucher, both of Detroit, Mich., U.S.A.

United Kingdom

583,590. **Brake and Clutch Apparatus.** Dunlop Rubber Co., Ltd., and H. J. Butler.

584,080. **Baby Soothers or the Like.** F. A. Middleton.

584,213. **Conveyers.** B. S. Wade.

584,226. **Endless-Track Vehicles.** E. M. N. Gardiner.

584,239. **Vehicular Endless Tracks of the Locked Girder Type.** Roadless Traction, Ltd., P. H. Johnson, and L. W. Tripp.

584,264. **Sealing Assemblies for Rotating Shafts o' Machinery.** D. Bridge & Co., Ltd., and J. Brown.

584,317. **Thermoplastic Substance for Uniting Textile Fabrics or Other Sheet Materials.** British Celenese, Ltd.

584,346. **Joint Making Packing.** Tecalemit, Ltd., and C. C. S. Le Clair.

584,447. **Instrument Mountings and Like Cushioning Supports.** Dunlop Rubber Co., Ltd., W. A Gurney, and T. E. H. Gray.

584,493. **Brake or Clutch.** L. S. E. Ellis (General Tire & Rubber Co.).

584,563. **Prevention of Ice Formation on Rotating Aircraft Parts.** British Thomson-Houston Co., Ltd., and L. J. Clark.

584,569. **Sealing Means for Fluid Pressure Apparatus.** Automotive Products Co., Ltd., Ribbesford Co., Ltd., and P. W. Thornhill.

584,672. **Electrical Condensers with Plastic Film Dielectrics.** E. Schaeffer.

584,680. **Thermoplastic Films in a Method of Forming Seals or Joints.** British Cellophane, Ltd., and C. R. Oswin.

584,701. **Resilient Mounting.** United States Rubber Co.

584,796-797. **Solenoids.** Dunlop Rubber Co., Ltd., and H. W. Trevaskis.

584,870. **Collapsible Bath Tubs.** E. T. Hope.

584,903. **Brake Apparatus for a Vehicle Wheel.** Dunlop Rubber Co., Ltd., and H. W. Trevaskis.

584,909. **Electric Cables.** Callender's Cable & Construction Co., Ltd., and G. M. Hamilton.

PROCESS

United States

2,415,023. **Rubber Covered Cord Fabric.** C. K. Novotny, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,415,028. **Continuous Manufacture of Non-Porous Rubber Sheeting from a Latex Composition.** G. P. Bosomworth, Akron, and C. K. Novotny, Mansfield, assignors to Firestone Tire & Rubber Co., Akron, both in O.

2,415,032. **Jettisonable Fuel Tank with a Bullet-Sealing Lining.** K. L. Edgar and H. H. Gregg, assignors to Firestone Tire & Rubber Co., all of Akron, O.

2,415,097. **Forming a Clutch Disk for Airplanes, Including the Application of Resin-Impregnated Asbestos Sheets to the Sur.aces of a Steel Plate.** Masayosi Hasimoto, Azabuku, Tokyo, Japan; vested in the Alien Property Custodian.

2,415,320. **Differential Drying of Resin-Impregnated Fabric to Obtain Differential Dyeing Effects.** C. M. Whittaker, Cheadle Hulme, H. A. Thomas, Hazel Grove, C. C. Wilcock, Salford, and C. P. Tattersfield, Audenshaw, assignors to Courtaulds, Ltd., London, all in England.

Dominion of Canada

439,691. **Thick Sheets of an Artificial Non-Elastic Film Forming Polymer.** C. G. Bonard, administrator of the state of H. Dreyfus, deceased, in his lifetime of London, England, assignee of J. H. Rooney, R. S. Locke, and P. R. Hawtin, all of London, England.

United Kingdom

584,284. **Composite Materials.** Dunlop Rubber Co., Ltd., J. Graham, and H. A. Hirst.

584,548. **Spinning Filaments of Acrylonitrile Polymers.** Imperial Chemical Industries, Ltd.

584,574. **Electrically Insulated Wires.** Pirelli-General Cable Works, Ltd., H. Barron, and C. F. Williams.

584,592. **Driving Belts.** W. & M. Duncan Ltd., and G. F. Tait.

CHEMICAL

United States

2,414,803. **Product of Emulsion Polymerization of a Mixture Containing Styrene, Ethyl Acrylate, and a Butadiene.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,414,816. **Continuous Method of Dehydrogenating Normal Butenes to Form Butadiene.** C. E. Kleiber, Irvington, D. L. Campbell, Short Hills, D. E. Stines, Plainfield, and C. C. Nelson, Cranford, all in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,414,817. **In the Production of Diolefins by Catalytic Dehydrogenation of More Saturated Hydrocarbons in the Presence of Steam, an Improved Method of Cooling the Resultant Gaseous Product Stream to Prevent Degradation of the Desired Diolefins.** C. E. Kleiber, Irvington, D. L. Campbell, Short Hills, and D. E. Stines, Elizabeth, all in N. J., and G. T. Atkins, Highlands, Tex., assignors to Standard Oil Development Co., a corporation of Del.

2,414,869. **Organic Acid Esters of Cellulose of Improved Molding Color.** C. I. Haney, Greenwich, Conn., and M. E. Martin, Cumberland, Md., assignors to Celanese Corp. of America, a corporation of Del.

2,414,880. **Subjecting Cyclopentanone in the Vapor Stage to Irradiation by Visible and Ultra-Violet Rays to Obtain Cyclobutane.** G. B. Kistiakowsky and S. W. Benson, both of Cambridge, assignors to Godfrey L. Cabot, Inc., Boston, both in Mass.

2,414,934. **Toluene-Soluble Polyvinyl Chloride of Improved Color Stability from Vinyl Chloride Dispersed in an Aqueous Medium Containing Formaldehyde and a Peroxide as Polymerization Catalyst.** P. W. Denny, Runcorn, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,414,950. **Free Biguanide.** J. R. Ingram, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,414,962. **In a Process for Dehydrogenation of a Mixture Containing Normal Butane and Normal Butene to Form Butadiene, Wherein Isobutene Is Formed, the Improvement of Separating the Isobutene from the Unconverted Normal Butane and Normal Butene before Their Return to the Dehydrogenation Step for Further Dehydrogenation.** W. J. Mattox, assignor to Universal Oil Products Co., both of Chicago, Ill.

2,414,982. **Preparation of 2,5-Dichlorodioxane by Chlorinating Dioxane Directly at Temperatures Below 10° C.** W. M. Smedley, Annapolis, Md.

2,414,999. **Ester from an Organic Acid Intimately Contacted with Ethylene in the Presence of an Esterification Catalyst Consisting of a Mixture of BF_3 and Hydrofluoric Acid.** A. E. Bearse and R. D. Morin, Columbus, O., assignors, by mesne assignments, to Standard Oil Co., Chicago, Ill.

2,415,000. **Process in Which an Organic Acid Is Intimately Admixed with a Catalyst, Including Boron Fluoride and a Hydrogen Halide, and Contacting the Resultant Mixture under Conversion Conditions with a Secondary Olefin.** A. E. Bearse and R. D. Morin, Columbus, O., assignors, by mesne assignments, to Standard Oil Co., Chicago, Ill.

2,415,002. **Organic Polysulfide.** H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,415,006. **Recovery of Butadiene from a Mixture Including Butene-1 and Butene-2.** K. H. Hachmuth, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,415,009. **Monomeric Butadiene Stabilized with a Compound of the Formula**

NHR
X
Y

Where X Is an Aryl Radical, R Is from the Group of the Hydrogen Atom and Hydrocarbon Radicals, and Y Is from the Group of OH, NH_2 and NHR_1, Where R_1 Is a Hydrocarbon Radical. L. F. Hatch, Austin, Tex., and D. E. Adelson and B. O. Blackburn, Berkeley, assignors to Shell Development Co., San Francisco, both in Calif.

2,415,029. **Sulfenamides.** G. E. P. Smith, Jr., assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,415,030. **In a Method of Bonding Rubber to a Magnesium Metal, Treating a Metal Surface with a Substance from the Group of Fluosilicic Acid, Hydrofluoric Acid in the Presence of Glass and a Reaction Product of Hydrofluoric Acid and a Glass.** J. R. Rafter, Sharon, Mass., assignor to Firestone Tire & Rubber Co., Akron, O.

2,415,069. **Alkyl Phenols.** J. A. Arvin, Homewood, and J. V. Hunn, Chicago, both in Ill., assignors to Sherwin-Williams Co., Cleveland, O.

2,415,096. **Oxygen-Treated Organic Product Capable at Elevated Temperatures of Forming a Solution with Solid Polyvinyl Chloride, Which Solution, on Cooling, Is a Gel at 70° F.** M. T. Harvey, South Orange, N. J., assignor to Harvel Research Corp., a corporation of N. J.

2,415,193. **Solution of a Synthetic Linear Polyamide in a Normally Liquid Monohydroxy Organic Cyanide.** A. O. Rogers, Lewiston, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,415,261. **Saturated Alpha, Omega-Dinitriles.** A. O. Rogers, Lewiston, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,415,295. **Preparing 2-Chlorobutadiene-1,3 by Subjecting 2,2,3-Trichlorobutane to Vapor Phase Pyrolysis at a Temperature from 300 to 600° C.** A. A. Levine and O. W. Cass, Niagara Falls, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,415,295. **Preparing 2-Chlorobutadiene-1,3 by Subjecting 2,2,3-Trichlorobutane to Vapor Phase Pyrolysis at a Temperature from 300 to 600° C. in the Presence of a Substance from the Group of Copper and Copper Compounds.** O. W. Cass, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,415,319. **Decreasing the Tendency of a Polyvinyl Acetal Resin Pressure Molding Composition to Stick to a Mold by Adding a Monohydroxy Carboxylic Acid Having at Least Two Carbon Atoms to the Composition.** G. W. Whitehead, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,415,335. **High Molecular Weight Glycols.** H. A. Bruson, Rydal, and W. D. Neiderhauser, assignors to Resinous Products & Chemical Co., both of Philadelphia, both in Pa.

2,415,347. **Water-Soluble Sulfonated Compound from the Condensation Product of a Distillate of Cashew Nut Shell Liquid and Formaldehyde.** E. H. Freund, and P. Mahler, assignors, by direct and mesne assignments, to General Foods Corp., all of New York, N. Y.

2,415,356. **Plasticized Composition Including Butadiene-Acrylonitrile Interpolymer and a Naphthenic Acid Amide.** H. B. Kellog, Union City, and G. E. Serniuk, Roselle, both in N. J., assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

2,415,366. **Diethylene Glycol Bis (Methyl Fumarate).** I. E. Muskat, Glenside, Pa., assignor to Marco Chemicals, Inc., a corporation of N. J.

2,415,400. **Interpolymerizate of Maleic Anhydride and a Methallyl Alkyl Ether, in Which the Reactants Are Combined in Substantially Equimolar Amounts.** R. T. Armstrong, Pompton Plains, N. J., assignor to United States Rubber Co., New York, N. Y.

2,415,414. **Succino-Nitrile.** W. M. Campbell, Shawinigan Falls, Quebec, assignor to Shawinigan Chemicals, Ltd., Montreal, both in P. Q., Canada.

2,415,438. **Cyclic Polymerization of Isobutylene to Obtain 1,1,3-Trimethylcyclopentane.** J. B. McKinley, Pittsburgh, and D. R. Stevens, Wilkinsburg, assignors to Gulf Research & Development Co., Pittsburgh, both in Pa.

2,415,449. **Reclaiming Vulcanized Conjugated Diolefin Polymer Compositions by Heating in the Presence of Available Oxygen, and Terminating the Treatment When an Initial Anomalously High Plasticity Has Been Attained before a Normal Slower Increase of Plasticity Has Substantially Progressed.** E. F. Sverdrup, Buffalo, N. Y., and J. C. Elgin, Princeton, N. J., assignors to U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y.

2,415,453. **Heating Dicyclopentadiene and an Alkenyl Halide at from 100 to 400° C. to Obtain a Bicycloalkene Halide.** C. L. Thomas, Riverside, assignor to Universal Oil Products Co., Chicago, both in Ill.

2,415,531. **Making Maleic Andydride by Vapor Phase Oxidation to a Hydrocarbon Containing Less than 10 but not Less Than Four Carbon Atoms per Molecule.** F. Porter, Syracuse, assignor to Solvay Process Co., New York, both in N. Y.

2,415,564. **Production of Cardable, Resilient, Non-Embrittled, Staple Regenerated Cellulose Fibers by Treatment with a True Water Solution of Aldehyde-Condensation Resin-Forming Components and a Latent Catalyst for Resinifying and Hardening the Components within the Fibers.** G. S. Radford, Norwalk, Conn., and I. S. Hurd, Abington, Pa., assignors, by direct and mesne assignments, to Rohm & Haas Co., Philadelphia, Pa.

2,415,638. **Production of a Resinous Copolymer by Polymerization of a Mixture of about Equal Parts by Weight of Methyl Isopropenyl Ketone and 2-Methyl-4-Methylene-1,3-Dioxolane.** W. O. Kenyon and T. F. Murray, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,415,645. **Reacting Ethylene Cyanohydrin and an Aqueous Alkaline Solution to Produce Hydracrylamide.** M. Lichtenwalter and O. F.

Wiedeman, both of Old Greenwich, Conn., assignors to American Cyanamid Co., New York, N. Y.

2,415,662. **Fractionally Distilling a Mixture Containing Acrylonitrile and Acetonitrile to Obtain Acrylonitrile.** J. W. Teter and W. J. Merwin, both of Chicago, Ill., assignors to Sinclair Refining Co., New York, N. Y.

2,415,752. **Resilient Friction Material for Brake Lining from Sulfur Combined with Previously Sulfurized Linseed Oil, Added to a Mixture of Mica, Iron Oxide, Clay, Coke, and Asbestos Fibers.** W. Nanfeldt, Clifton, assignor to World Bestos Corp., Paterson, both in N. J.

2,415,755. **Coating Compostion Including a Crystallizing Solution Consisting of a Crystallizing Substance from the Group of Acetanilide, Phthalic Acid, Salicylic Acid and Saliformin Dissolved in a Solvent and Chlorinated Rubber.** W. A. Waldie, Oakwood, assignor to Chemical Developments Corp., Dayton, both in O.

2,415,839. **Composite Structure Including a Fibrous Reinforcing Structure Bonded to a Vulcanized Rubber by Means of a Rubber and an Organic Cyanate from the Group of Polyisocyanate, Polyisothiocyanates, and Mixed Isocyanate-Isothiocyanate Compounds.** A. M. Neal and J. J. Verbanc, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,415,851-852. **High Molecular Weight Alkyl Disulfides.** W. A. Schulze and W. W. Crouch, both of Bartlesville, Okla, assignors to Phillips Petroleum Co., a corporation of Del.

2,415,878. **Preparing Isoprene by Reacting Acetone Acetal with Ethylene in the Presence of a Composite Catalyst.** W. J. Hale, Midland, Mich., assignor to National Agrol Co., Inc., Washington, D. C.

2,415,901. **Pressure-Sensitive Adhesive Mass Including Polyvinyl Normal Butyl Ether and Factice.** W. L. Nelson, Highland Park, and W. N. Morris, New Brunswick, N. J., assignors to Johnson & Johnson, a corporation of N. J.

2,415,921. **Separation of Butenes, N-Butane, C_3, and Lighter Hydrocarbons by Extractive Distillation.** C. R. Wagner, Utica, O., assignor to Phillips Petroleum Co., a corporation of Del.

2,416,038. **Furfuryl Alcohol Resins.** W. H. Adams, Jr., assignor to Haveg Corp., both of Newark, Del.

2,416,041. **Fabric Carrying a Nitrocellulose Coating and a Top Coating Including an Alcohol-Water Soluble Synthetic Linear Interpolyamide.** P. R. Austin, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,416,042. **Compounds of the Class of N-Alkylidene, N-Aralkylidene, and N-Cycloalkylidene Aliphatic Diamines.** R. E. Brooks, Edgemoor Terrace, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,416,046. **In a Process for the Preparation of Ethylene-Urea, the Step of Subjecting to at Least 175° C. from Two to Eight Moles of Urea per Mole of Ethylene Glycol.** H. R. Dittmar and D. J. Loder, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,416,057. **In the Preparation of Ethylene Urea, the Step of Subjecting to at Least 175° C., but below the Decomposition Temperature of the Ethylene Urea, Ethylene Glycol and Urea to Reaction under Pressure above Atmospheric Pressure.** A. T. Larson and D. J. Loder, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,416,060. **Curing Substituted Monoolefin Hydrocarbon Polymers with Polyvalent Metal Salts.** A. McAlevy, D. E. Strain, and F. S. Chance, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,416,061. **Curing Polymers of Substituted Monoolefinic Hydrocarbons with Polyvalent Metal Compounds.** A. McAlevy, D. E. Strain, and F. S. Chance, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,416,069. **Vulcanized Compounds of Chlorinated Polymer of Ethylene Containing 35 to 45% Chlorine, Sulfur, a Vulcanization Accelerator, and a Group II Metal Oxide.** S. LeR. Scott, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,416,106. **Reacting Olefinic Hydrocarbons at Polymerizing Conditions in the Presence of Boron Trifluoride and an Acid Fluoride of a Metal.** C. B. Linn, Riverside, and V. N. Ipatieff, assignors to Universal Oil Products Co., both of Chicago, both in Ill.

2,416,143. **For a Laminated Electrically Insulating Material Including Mica Flakes, a Bonding Agent Consisting of the Reaction Product of Styrene and the Half Ester of Maleic Anhydride and Castor Oil.** L. J. Berberich, Forest Hills, assignor to Westinghouse Electric Corp., East Pittsburgh, both in Pa.

2,416,151. **Improved Crease-Resistance of Cellulosic Materials Obtained by Treatment with a Mixture of Urea and Formaldehyde or a Mixture of Thiourea and Formaldehyde and a Second Solution Containing an Acid Catalyst.** J. Boulton, Bocking, Braintree, England, assignor to Courtaulds, Ltd., London, England.

2,416,182. **Bonded Abrasive Article Obtained by Intermixing Polyvinyl Butyral with at Least One Polymerizable Amine-Bearing Resin Compound, Incorporating Abrasive Grains with the Aid of at Least One Alkylating Plasticizing Compound, Shaping, and Heating to Polymerize and Interreact Ingredients of the Mass.** S. S. Kistler, West Boylston, assignor to Norton Co., Worcester, both in Mass.

2,416,218. **Resilient Composition Formed by Heating Chlorinated Petroleum Wax with a Phenol in the Presence of a Friedel-Crafts Catalyst to Produce a Condensation Product and thereafter Heating This Condensation Product with Hexamethylenetetramine to React Same.** O. M. Reiff, Woodbury, N. J., assignor to Socony-Vacuum Oil Co., Inc., a corporation of New York.

2,416,219. **Resilient Composition Formed by Heating Chlorinated Petroleum Wax with a Phenol in the Presence of a Friedel-Crafts Catalyst to Produce a Condensation Product and thereafter Heating This Condensation Product with Sulfur Monochloride to React Same.** O. M. Reiff, Woodbury, N. J. assignor to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

2,416,227. **Diolefins.** W. D. Seyfried, Wooster, Tex., assignor to Standard Oil Development Co., a corporation of Del.

2,416,232. **Making Coated Organic Fiber Material by Contacting the Material with an Aqueous Emulsion of a Resinous Polymer of Butadiene, Removing Volatile Constituents to Leave the Polymer Deposited on the Material, and Then Heating the Product above the Melting Point of the Polymer to Form a Continuous Film.** F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co., a corporation of Pa.

2,416,250. **Dihydronordicyclopentadienyl - Substituted Formals.** H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

Dominion of Canada

438,956. **A Propionic Ester of 2-Methyl-2-Hydroxy-Butene-2.** United Gas Improvement Co., Philadelphia, assignee of F. J. Soday, Swarthmore, both in Pa., U.S.A.

438,960. **In a Process for Preparing an Organic Isocyanate by Reacting the Corresponding Amine with Phosgene, the Improvement Which Includes Carrying out the Reaction in the Presence of a Tertiary Amine Catalyst.** Wingfoot Corp., Akron, assignee of J. G. Lichty, Stow, and N. V. Seeger, Cuyahoga, all in O., U.S.A.

439,124. **Method of Manufacture Including Applying a Mixture of Urea Formaldehyde Glue with a Catalyst and Asbestos to a Surface of a Ligno-Cellulose Substance, and Applying Pressure and Heat until the Glue and Asbestos Chemically React and Harden and Are Integrally United to the Substance.** H. W. Hall, Newton, Mass., U.S.A.

439,160. **Unmasticated Synthetic Rubber Product Obtained from a Mixture of Butadiene, Isobutylene and Ethylene Containing Carbon Black, by Polymerizing in the Presence of a Suitable Catalyst, Agitating the Mixture during Polymerization to Prevent Agglomeration of the Carbon Black, Separating Unpolymerized Constituents, Removing the Material to a Mold before the Crude Rubber Stage Has Been Reached, and Completing Polymerization in the Mold.** T. A. TeGrotenhuis, Olmsted Falls, O., U.S.A.

439,172. **Thermosetting Composition Including Zein Dissolved in Shellac.** American Maize-Products Co., New York, N. Y., assignee of H. M. Weber, Chicago, Ill., both in the U.S.A.

439,173. **Solidifying Solution of Zein in a Natural Resin.** American Maize-Products Co., New York, N. Y., assignee of H. M. Weber, Chicago, Ill., both in the U.S.A.

439,213. **Abrasive Article Made from a Mix Including Butadiene Polymer, Abrasive Grain, a Vulcanizing Agent, a Resin Polymer Having Amino Groups, and a Halogen-Bearing Plasticizing Agent for the Butadiene Which also Reacts with the Resin Polymer at Elevated Temperatures to Harden It.** Norton Co., Worcester, assignee of S. S. Kistler, West Boylston, both in Mass., U.S.A.

439,214. **In the Manufacture of a Grinding Wheel, Abrasive Grains Bonded with the Reaction Product under Heat Treatment of Primary Aromatic Amine Formaldehyde Resin and a Grain-Wetting and Resin-Hardening Agent.** Norton Co., Worcester, assignee of L. Coes, Jr., Brookfield, both in Mass., U.S.A.

439,232. **Vulcanized Butadiene-Styrene Copolymer Compound Including an Aldolnaphthylamine.** R. T. Vanderbilt Co., Inc., New York, assignee of A. A. Somerville, Carmel, both in N. Y., U.S.A.

439,430. **Adhesive Tape Having a Eucohesive Adhesive Coating on One Side and a Composite Film Backing Including an Intermediate Film of Adhesive Cement, Which Is the Dried Residue of an Aqueous Disperson of an Alkyd Resin Elastomer Reaction Product.** Minnesota Mining & Mfg. Co., assignee of J. W. Pearson, both of St. Paul, Minn., U.S.A.

439,431. **Adhesive Tape Coating Including a Stably Tacky Adhesive Formed by Heating a Bodied Varnish Oil, a Compatible Tackifier, Oil-Soluble Heat-Reactive Phenol-Aldehyde Resin, and Sulfur Vulcanizing Agent.** Minnesota Mining & Mfg. Co., assignee of J. Ebel and R. G. Drew, all of St. Paul, Minn., U.S.A.

439,543. **As Bonding Agent in an Abrasive Article, a Mixture of Rubber, Sulfur to Vulcanize the Rubber to Hard Rubber, and a Synthetic Rubber-Like Material.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of C. E. Drake, Bloomfield, N. J., U.S.A.

439,544. **Forming an Aqueous Acidic Emulsion of a Vinyl Aromatic Compound Having a pH Value between 1.5 and 3, and Containing a Water-Soluble Peroxide, and Heating the Emulsion to Polymerize the Vinyl Aromatic Compound.** Dow Chemical Co., assignee of E. C. Britton and W. J. Lefevre, all of Midland, Mich., U.S.A.

439,598. **Polyamide Compositions Suitable for Conversion into Films, Filaments, and Other Articles by Shaping While in Molten.** C. G. Bonard, administrator of the estate of H. Dreyfus, deceased, both of London, assignee of R. W. Moncrieff, C. W. Sammons, and E. W. Wheatley, all of London, both in England.

439,639-640. **Obtaining an Improved Polyamide Composition from a Mixture of Different Preformed Synthetic Linear Polyamides.** Canadian Industries, Ltd., Montreal, P. Q., assignee of L. F. Salisbury, Wilmington, Del., U.S.A.

439,642. **Resinous Material Obtained by Emulsifying a Mixture of an Asymmetrical Dihalogenated Ethylene and a Polymerizable Compound from the Group of an Alkyl Ester and Nitrile of an Alpha Methylene Monocarboxylic Acid, in Aqueous Medium Containing a Dissolved Salt of Perdisulfuric Acid and a Dispersing Agent, and Heating at a Temperature from 0 to 80° C.** Canadian Industries, Ltd., Montreal, P. Q., assignee of H. W. Arnold, Marshallton, Del., U.S.A.

439,643. **Resinous Material Obtained by Emulsifying a Vinyl Halide in an Aqueous Medium Containing a Dissolved Salt of Perdisulfuric Acid and a Dispersing Agent, and Heating at a Temperature from 0 to 80° C.** Canadian Industries, Ltd., Montreal, P. Q., assignee of D. D. Coffman and F. C. McGrew, both of Wilmington, Del., U.S.A.

439,644. **Polymerization of an Emulsion of a Mixture of a Vinyl Halide with an Alkyl Ester of an Alpha-Methylene Aliphatic Monocarboxylic Acid, in an Aqueous Medium Containing a Dissolved Salt of Perdisulfuric Acid and a Dispersing Agent.** Canadian Industries, Ltd., Montreal, P. Q., assignee of H. W. Arnold, Wilmington, Del., M. M. Brubaker, Boothwyn, Pa., and G. L. Dorough, Niagara Falls, N. Y., all in the U.S.A.

439,645. **Modified Polymer of Dioxolane.** Canadian Industries, Ltd., Montreal, P. Q., assignee of D. J. Loder and W. F. Gresham, both of Wilmington, Del., U.S.A.

439,646. **Polymerization Process for Tetrafluorethylene.** Canadian Industries, Ltd., Montreal, P. Q., assignee of M. M. Brubaker, Boothwyn, Pa., U.S.A.

439,647. **Polymerization Process for Tetrafluorethylene.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. M. Joyce, Jr., Marshallton, Del., U.S.A.

439,648. **Reacting Methyl Hydroxyacetate with Vinyl Acetate in the Presence of Mercuric Phosphate at 70-100° C. and under Anhydrous Conditions.** Canadian Industries, Ltd., Montreal, P. Q., assignee of D. D. Coffman, Wilmington, Del., U.S.A.

439,649. **Sulfur-Containing Esters of Hydrolyzed Interpolymers of Ethylene with a Vinyl Ester of an Organic Carboxylic Acid.** Canadian Industries, Ltd., Montreal, P. Q., assignee of W. H. Sharkey, Wilmington, Del., U.S.A.

439,650. **Polymer of Ethylene with a Vinyl Thioester of an Organic Carboxylic Acid.** Canadian Industries, Ltd., Montreal, P. Q., assignee of M. M. Brubaker, Boothwyn, Pa., U.S.A.

439,652. **Flexible Article Coated with a Film of Alkoxymethyl Polyamide.** Canadian Industries, Ltd., Montreal, P. Q., assignee of B. Graham, Wilmington, Del., and H. S. Turner, Swarthmore, Pa., U.S.A.

439,653. **Continuously Polymerizing Monomeric Methyl Methacrylate to Form a Syrup of Polymer Dissolved in Monomer.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. T. Coffman, North Arlington, and B. M. Marks, Newark, both in N. J., U.S.A.

439,657. **In Making High Wet-Strength Paper, the Use of a Resin from the Group of the Melamine-Formeldehyde Resins and the Melamine-Monoureide-Formaldehyde Resins.** Canadian Kodak Co., Ltd., Toronto, Ont., assignee of F. W. Boughton, Rochester, N. Y., U.S.A.

439,683. **Structure Including a Metallic Body, a Resinous Member Attached thereto,**

and an Interposed Layer Including a Cyclized Polymethylpentadiene. Standard Oil Development Co., Linden, N. J., assignee of J. D. Calfee, Jamaica, L. I., N. Y., and D. W. Young, Roselle, N. J., both in the U.S.A.

United Kingdom

582,713. **Separation and Segregation of Diolefins from Hydrocarbon Mixtures.** Standard Oil Development Co.

582,719. **Polymerization Catalysts.** E. I. du Pont de Nemours & Co., Inc.

582, 721. **Vinylidene Chloride Compositions.** Distillers Co., Ltd., J. J. P. Staudinger, D. Faulkner, and G. T. Wright.

582,770. **Sponge Rubber.** Wingfoot Corp.

582,799. **Insulating Compositions.** British Thomson-Houston Co., Ltd.

582,807. **Synthetic Resin Molding Compositions.** J. Ferguson & Sons, Ltd., and S. A. Ede.

582,853. **Synthetic Resins.** E. Hene.

582,887. **Copolymerization of Isoolefins and Diolefins.** Standard Oil Development Co.

582,890. **Dialkyl Peroxides as Polymerization Catalysts.** Imperial Chemical Industries, Ltd.

582,900. **Colored Synthetic Resin Compositions.** J. W. Coates, J. W. C. Crawford, and Imperial Chemical Industries, Ltd.

582,900. **Colored Synthetic Resin Compositions.** J. W. Coates, J. W. C. Crawford, and Imperial Chemical Industries, Ltd.

582,966. **Nitronitriles.** G. D. Buckley, R. L. Heath, Imperial Chemical Industries, Ltd.

582,986. **Resin Emulsions.** E. P. Newton. (Hercules Powder Co.)

583,007. **Thioplast-Containing Composition Suitable for Sealing or Adhesive Purposes.** B. B. Chemical Co., Ltd., L. E. Puddlefoot, W. H. Swire, and A. Bramley.

583,021. **Condensation Products of the Furylmethane Derivative Type.** P. C. Kruyff and A., Jr., and J. H. Van Hoboken, trading as A. Van Hoboken & Co.

583,118. **High Molecular Weight Organic Compounds Containing Sulfonic Groups.** Imperial Chemical Industries, Ltd.

583,159. **Organic Disulfides.** R. H. Cooper and Monsanto Chemical Co.

583,166. **Polymerization and Interpolymerization of Ethylene.** R. G. R. Bacon, R. B. Richards, and Imperial Chemical Industries, Ltd.

583,172-173. **Polymers Containing Oxygen.** Imperial Chemical Industries, Ltd.

583,174. **Resinous Products.** E. I. du Pont de Nemours & Co., Inc.

583,175. **Chemical Compounds for Use in the Vulcanization of Rubber.** Wingfoot Corp.

583,178. **Polymerization and Interpolymerization of Ethylene.** J. S. A. Forsyth and Imperial Chemical Industries, Ltd.

583,181. **Polymerization Products of Ethylene.** E. I. du Pont de Nemours & Co., Inc.

583,225. **Polymerization of 6 Membered Cyclic Formals.** E. I. du Pont de Nemours & Co., Inc.

583,236. **Phenolic-Aldehyde Resinous Compositions.** Cellomold, Ltd., D. N. Davies, and S. R. Badley.

583,268. **Alkyd Resins.** Imperial Chemical Industries, Ltd.

583,279. **Stabilization of Rubber.** National Oil Products Co.

583,290. **Resinous Compositions Including Copolymers of Vinyl Chloride and a Fumaric Ester.** E. I. du Pont de Nemours & Co., Inc.

583,367. **Synthetic Resinous Condensation Products.** British Thomson-Houston Co., Ltd. (General Electric Co.)

583,419. **Organic Esters.** E. I. du Pont de Nemours & Co., Inc.

583,426. **Curing Butadiene Copolymers.** United States Rubber Co.

583,468. **Alpha-Nitro-Isobutene.** A. E. W. Smith, R. H. Stanley, C. W. Scaife, and Imperial Chemical Industries, Ltd.

583,474. **Vinylidene Copolymers.** Distillers Co., Ltd., J. J. P. Staudinger, D. Faulkner, and G. T. Wright.

583,481. **Polymeric Rubber-Like Materials.** J. C. Arnold. (Standard Oil Development Co.)

583,482. **Polymeric Materials.** Imperial Chemical Industries, Ltd.

583,504. **Melamine.** E. I. du Pont de Nemours & Co., Inc.

583,573. **Rubber-Like Materials.** W. Furness, D. B. Kelly, and Imperial Chemical Industries, Ltd.

583,633. **Organic Esters.** E. I. du Pont de Nemours & Co., Inc.

583,634. **Chlorinated Hydrocarbons.** E. I. du Pont de Nemours & Co., Inc.

583,645. **Softeners for Rubber.** United States Rubber Co.

583,670. **Coating Compositions.** E. I. du Pont de Nemours & Co., Inc.

583,686. **Compositions Including Polyvinyl Fluoride.** E. I. du Pont de Nemours & Co., Inc.

583,720. **Aminotriazines.** E. I. du Pont de Nemours & Co., Inc.

583,72[illegible]. **Treatment of Polyvinyl Chloride.** J. A. Crabtree & Co., Ltd., and F. G. Dodd.

583,754. **Synthetic Resins.** A. Bowman, E. M. Evans, and Imperial Chemical Industries, Ltd.

583,786. **Cellular Materials.** Expanded Rubber Co., Ltd., A. Cooper, and D. E. Partington.

583,804. **Polymerization or Interpolymerization of Monoolefins.** E. I. du Pont de Nemours & Co., Inc.

583,805. **Polymerization or Interpolymerization of Monoolefins.** Imperial Chemical Industries, Ltd.

583,825. **Microporous Rubber-Like Material.** National Cash Register Co., Ltd. (National Cash Register Co.).

583,844. **Stabilized Mixtures Containing Melamine and Formaldehyde or Condensation Products thereof.** Society of Chemical Industry in Basle.

583,850. **Polymers and Interpolymers of Ethylene.** E. I. du Pont de Nemours & Co., Inc.

583,874. **Organic Fluorine Compounds.** E. I. du Pont de Nemours & Co., Inc.

583,875. **Organo-Silicon Polymers.** Corning Glass Works.

583,878. **Organo-Siloxanes.** Corning Glass Works.

583,939. **Filaments of Acrylonitrile Polymers.** Imperial Chemical Industries, Ltd.

583,947. **Purification of Lactams.** E. I. du Pont de Nemours & Co., Inc.

584,010. **Rubber and Elastomers.** E. R. Wellburn and Plessey Co., Ltd.

584,015. **Polyvinyl Chloride Compositions.** R. L. Stephens, W. O. Steel, and Imperial Chemical Industries, Ltd.

584,086. **Mononitromononitriles.** Imperial Chemical Industries, Ltd., G. D. Buckley, and A. Lowe.

584,142. **Moistureproofing Compositions.** M. F. Monbiot.

584,176. **Resinous Condensation Products.** Imperial Chemical Industries, Ltd., D. Atherton, W. Charlton, and J. B. Harrison.

584,241. **Phenols.** Imperial Chemical Industries, Ltd., and C. A. Cross.

584,256. **Phenolic Compounds.** Shell Development Co.

584,257. **Curing Rubber and Rubber Substitutes.** J. C. Arnold (Standard Oil Development Co.).

584,309. **Polymerization Products of Ethylene.** Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co.).

584,324. **Ethylene Interpolymers.** Imperial Chemical Industries, Ltd., R. B. Richards, J. R. Myles, and D. Whittaker.

584,426. **Catalytic Polymerization of Monoolefins.** Standard Oil Development Co.

584,428. **Polymerization of Hydrocarbons.** J. C. Arnold (Standard Oil Development Co.).

584,434. **Stabilization of Vinyl Resins.** W. W. Triggs (Wingfoot Corp.).

584,437. **Plasticized Vinyl Copolymer Resin Yarns, Fabrics, and Other Textile Articles.** Carbide & Carbon Chemicals Corp.

584,561. **Synthetic Linear Polyamides.** E. I. du Pont de Nemours & Co., Inc.

584,565. **Aqueous Dispersions of Synthetic Rubber-Like Materials.** International Latex Processes, Ltd.

584,601. **Butadiene.** H. G. C. Fairweather (Air Reduction Co., Inc.).

584,607. **Methacrylic Acid and Its Esters.** P. May (C. Weizmann).

584,613. **Sulfur-Containing Synthetic Linear Polyamides.** E. I. du Pont de Nemours & Co., Inc.

584,620. **Polythene Compositions.** Imperial Chemical Industries, Ltd., E. L. Midwinter, and R. B. Richards.

584,622. **Synthetic Resins.** Kodak, Ltd.

584,658. **Transparent Sheets.** E. I. du Pont de Nemours & Co., Inc.

584,662. **Vinyl Cyanide.** E. I. du Pont de Nemours & Co., Inc.

584,667. **Reclaiming Synthetic Rubber or Scrap Containing Synthetic Rubber.** L. Mellersh-Jackson (D. S. Le Beau).

584,674. **Stabilization of Vinyl Halide Polymer and Copolymer.** Wingfoot Corp.

584,691. **Improved Interpolymers of Vinyl Chloride and an Ethylenedicarboxylic Acid Ester.** E. I. du Pont de Nemours & Co., Inc.

584,778. **Compounding and Vulcanization of Synthetic Rubber.** R. T. Vanderbilt, Co., Inc.

584,788. **Methylethylketone from 2:3-Butylene Glycol.** Distillers Co., Ltd., and T. Bewley.

584,793. **Nitrothioethers and Nitromercaptans.** Imperial Chemical Industries, Ltd., R. L. Heath, and A. Lambert.

584,794. **Polymers and Interpolymers of Ethylene.** E. I. du Pont de Nemours & Co., Inc.

584,795. **Polymers and Interpolymers of Olefins.** E. I. du Pont de Nemours & Co., Inc.

584,798. **Artificial Aqueous Dispersions of Natural and Synthetic Rubbers, Rubber Substitutes, and Rubber-Like Substances.** N. Talalay.

584,815. **Curing Olefin-Diolefin Copolymers.** United States Rubber Co.

584,828. **Hydrolyzed Interpolymers of Acrylonitrile and Vinyl Esters.** Imperial Chemical Industries, Ltd.

584,832. **Insulator Compound for Electric Cables, Etc.** General Motors Corp.

584,875. **Vulcanizing Artificial Rubber-Like Masses Including Conjugated Butadienes.** E. I. du Pont de Nemours & Co., Inc.

584,906. **Rubber in Cellular Form.** Callender's Cable & Construction Co., Ltd., and G. M. Hamilton.

584,908. **Rubber in Cellular Form.** Callender's Cable & Construction Co., Ltd., G. M. Hamilton, and L. G. Brazier.

584,928. **Artificial Resinous Substances.** Frank F. Aspro, Ltd., and British Artificial Resin Co., Ltd.

584,933. **Hardenable Compositions Containing Aminotriazinealdehyde Resins.** American Cyanamid Co.

584,946. **Synthetic Rubber Compounding.** R. T. Vanderbilt Co., Inc.

MACHINERY

United States

2,414,948. **Apparatus for Extrusion Filling a Cavitied Mold Having a Filling Opening.** O. E. Hermanns, Akron, and E. Herzog, Cuyahoga Falls, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,415,027. **Mechanism for Drying a Continuous Length of Current Conducting Material While Advancing It at a Uniform Rate.** G. P. Bosomworth and E. B. Huffman, assignors to Firestone Tire & Rubber Co., all of Akron, O.

2,415,091. **Machine for Kneading and Mixing Rubber and Like Plastic Substances.** K. Frei, Oberesslingen, Germany; vested in the Alien Property Custodian.

2,415,291. **Tractor Tire Mold.** J. G. Kreyer, deceased, late of Akron, O., by H. E. Kreyer, executrix, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,415,504. **Apparatus for Molding Deeply Contoured Concave-Convex Articles.** F. J. MacDonald, Brookline, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,415,959. **Portable Vulcanizing Kit.** J. B. Miller, Webster Groves, assignor to Mines Equipment Co., St. Louis, both in Mo.

2,416,195. **Tire Stripper.** G. H. Mitchell, New York, N. Y.

2,416,203. **Tire Rasp.** P. S. Neilson, Chicago, Ill.

Dominion of Canada

439,435. **Automatic Cut-off Roll.** Raybestos-Manhattan, Inc., assignee of G. F. Kingman, both of Bridgeport, Conn., U.S.A.

United Kingdom

584,055. **Apparatus to Measure Deformation of Materials under Compression and Tension.** Cope & Cope, Ltd., J. H. Cotton, and C. J. Cope.

584,095. **Vulcanizing Machines for Use in the Repair of Motor Vehicle Tires or Covers, or of Other Rubber or Rubberized Articles.** L. Steiner.

584,418. **Apparatus for Vulcanizing Natural Rubber and Synthetic Rubber Cycle Tires.** F. White.

584,487. **Presses for Molding and Vulcanizing Tires.** A. H. Stevens (McNeil Machine & Engineering Co.).

584,929. **Extruders for Non-Metallic Plastic Materials.** St. Helen's Cable & Rubber Co., Ltd., A. V. Swallow, and A. J. Ensor.

584,932. **Apparatus for Injection Molding of Plastic Materials.** General Motors Corp.

UNCLASSIFIED

United States

2,415,019. **Apparatus for Filling Tires with Fluid.** W. W. McManus, assignor to Wingfoot Corp., both of Akron, O.

2,415,270. **Tire Chain.** T. B. Allardice, Mountain Lakes, N. J.

2,415,583. **Tire Chain.** G. M. Eddy, Kansas City, Kan., assignor to Roll-O-Matic Corp., Denver, Colo.

Dominion of Canada

439,493. **Hose Nozzle.** W. Gronwald, Laurentian View, Ont.

439,530. **Flexible Hose End Fitting.** Auto-

motive Products Co., Ltd., assignee of W. H. J. Brock, both of Leamington Spa, Warwick, England.

United Kingdom

584,128. **Valve Means for Facilitating the Inflation and Deflation of Pneumatic Envelopes or Bags.** N. Strausser.

584,696. **High-Frequency Electric Coupling System.** Standard Telephones & Cables Ltd.

584,886. **Anti-Skid Devices for Road Vehicle Wheels.** A. Whitehouse.

584,908. **Cable Couplings.** Callender's Cable & Construction Co., Ltd., L. G. Brazier, and D. T. Hollingsworth.

TRADE MARKS

United States

427,059. Representation of a shield containing the words: **"Phillips 66."** Repair kit. Phillips Petroleum Co., Bartlesville, Okla.

427,064. **Champion.** Belting, hose, and packing. Lee Rubber & Tire Corp., Youngstown, O.

427,071. **Arcor.** Shoe repair items. Auburn Rubber Co., Auburn, Ind.

427,087. **Mac's.** White tire coating. Mac's Super Gloss Co., Los Angeles, Calif.

427,092. Representation of a man holding the world with the word: **"Atlas."** Belting. R. R. Howell Co., Minneapolis, Minn.

427,138. **Ti-Fast.** Liquid cement adhesive. Titanine, Inc., Union, N. J.

427,139. **Ti-Grip.** Liquid cement adhesive. Titanine, Inc., Union, N. J.

427,142. **Silv-O-Gold.** Rubber stamp ink. A. Bender, Mastic, N. Y.

427,146. Representation of a circle with a band across it and the word: **"daca."** Combs. David A. Christiansen Associates, Inc., New York, N. Y.

427,157. **Charbon.** Corsets and girdles. H. Kress, doing business as Character Foundations, New York, N. Y.

427,172. **Invader.** Tires. Lee Rubber & Tire Corp., doing business as Republic Rubber Division, Youngstown, O.

427,173. **Goodrich.** Adhesives. B. F. Goodrich Co., New York, N. Y.

427,178. **Super Chief.** Tires and tubes. Mohawk Rubber Co., Akron, O.

427,183. **Chemox.** Oxygen breathing apparatus. Mine Safety Appliances Co., Pittsburgh, Pa.

427,205. **Tirecap.** Tires and camelback. Oliver Tirecap Supply Co., Oakland, Calif.

427,208. **Plasticord.** Plastic covered cords, ropes, and twine. M. R. White, doing business as Plasticlad Co., Chester, N. Y.

427,213. **Plasticlad.** Plastic cordage. M. R. White, Chester, N. Y.

427,222. Representation of a diamond containing the word: **"Haskellite,"** above the word: **"Plastiply."** Laminated material. Haskelite Mfg. Corp., Grand Rapids, Mich.

427,237. **Textilco.** Coated fabrics. Textileather Corp., Toledo, O.

427,254. **Filmtex.** Rainwear, shower curtains, etc. Rainwear Supply, Inc., Passaic, N. J.

427,266. **Chlor-Isopol.** Powdered chlorinated synthetic rubber. Union Bay State Chemical Co., Inc., Cambridge, Mass.

427,314. **Paulite.** Luminescent plastic molding powders. McCallum, Devitt & Ford, Chicago, Ill.

427,317. **Pep-Step.** Arch supports. Pep-Step Products, Lebanon, Pa.

427,329. **Koroseal.** Play ponds. B. F. Goodrich Co., Akron, O.

427,338. Representation of a square containing the words: **"Stick-E-Bak."** Fabric coverings. Adhesive Roller Covering Co., Philadelphia, Pa.

427,358. **Neo-Cork.** Sheet packing and gasket material. Wolverine Fabricating & Mfg. Co., Inc., Detroit, Mich.

427,376. **Snap-Tite.** Gaskets and washers. Haynes Mfg. Co., Cleveland, O.

427,462. **Fleetway.** Battery charging apparatus. United States Rubber Co., New York, N. Y.

427,527. **Autohavit.** Tire removing tool. Autohavit Co., Atlanta, Ga.

427,574. **Road King.** Tires and tubes. Dayton Rubber Mfg. Co., Dayton, O.

427,589. **Jet.** Golf balls. Wilson Sporting Goods Co., Chicago, Ill.

427,612. **Superset.** Synthetic finishing resins. American Cyanamid Co., New York, N. Y.

427,623. **Float Coat.** Life jackets. B. M. Wilber, doing business as Wilber & Son, San Francisco, Calif.

427,640. Representation of a foot with the words: **"Johansen Fashion Forecasts Saint Louis-New York."** Footwear. Johansen Bros. Shoe Co., Inc., St. Louis, Mo.

427,653. Representation of a figure with the words: **"Le Sonier."** Shower caps and make-up coveralls. Lesonier, Inc., Boston, Mass.

427,657. **Contour-lastic Net.** Foundation garments. Franco Corset Co., New York, N. Y.

427,660. **Puncho.** Footwear. Swan Shoe Co., Inc., Baltimore, Md.

427,661. Representations of two half circles each containing representation of a little boy. Footwear. O'Donnell Shoe Corp., Humboldt, Tenn.

427,665. **GMP.** Pencils, fountain pens, and erasers. Gold Leaf & Metallic Powders Co., New York, N. Y.

427,669. **Radiac Res-N-oid.** Resin bonded grinding wheels. A. P. Desanno & Son, Inc., Phoenixville, Philadelphia, Pa.

427,674. **Sambros of Hollywood.** Footwear. S. Friedman, Paterson, N. J.

427,692. **Top State.** Footwear. Holly Shoe Co., Boston, Mass.

427,696. **Mobil.** Tires, inner tubes, hose, and belting. Socony-Vacuum Oil Co., Inc., New York, N. Y.

427,705. **Vocation.** Footwear. Hulskamp Bros. Co., Keokuk, Iowa.

427,706. **doodle-bug.** Rainwear. Spatz Bros., Inc., New York, N. Y.

427,709. **Mondex.** Foundation garments. Mondex, Inc., New York, N. Y.

427,716. **Inner Sanctum.** Suspenders, garters, and supporters. Aristocrat Leather Products, Inc., New York, N. Y.

427,718. **Brazen.** Foundation garments. Brazen Creations, Chicago, Ill.

427,719. Representation of a crystal gazer with the words: **"Crystal Gazer."** Footwear. A. Sandler Co., Boston, Mass.

427,742. The word: **"Unitension"** with thin straight lines through it. Hose. United States Rubber Co., New York, N. Y.

427,746. **Black Beauty.** Bowling balls. Brunswick-Balke-Collender Co., Wilmington, Del.

427,751. **Air Chief.** Tires and tubes. Mohawk Rubber Co., Akron, O.

427,752. **Chief.** Tires and tubes. Mohawk Rubber Co., Akron, O.

427,763. **Hydro Glass.** Shower caps, rainwear, etc. Hydro-Tex Corp., Chicago, Ill.

427,779. **Karol Kane.** Footwear. Kane, Dunham & Kraus, Inc., Washington, Mo.

427,786. **Thousand Use.** Plastic sheeting. Atwater Mfg. Co., Inc., New York, N. Y.

427,790. **Manchester Shoe.** Footwear. Manchester Shoe Stores, Inc., Baltimore, Md.

427,794. **Armstrong.** Tires and tubes. Armstrong Rubber Co., West Haven, Conn.

Maylayan Rubber Statistics

The following statistics have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C.2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

To	January, 1947 Sheet and Crepe	Latex, Concentrated Latex, Revertex (Dry Rubber Content)
Argentine Republic	1,731	....
Australia	2,964	....
Belgium	1,797	15
British India	33	....
Canada	8,236	30
Chile	395	....
Cuba	9	....
Czechoslovakia	70	....
Denmark	268	2
Egypt	303	....
Finland	380	17
France	10	15
Hong Kong	1,231	....
Hungary	70	....
Italy	3,892	....
Japan	1,650	....
Mexico	100	....
Netherlands	1,132	18
New Zealand	153	1
Norway	419	7
Other Countries in South America	535	....
Palestine	35	....
Spain	500	17
Sweden	2,080	19
Switzerland	75	6
Union of South Africa	1,898	....
United Kingdom	18,721	919
U. S. A.	17,751	....
TOTAL	66,438	1,066

Foreign Imports of Rubber in Long Tons

Singapore Imports from

Singapore Imports from	January, 1947 Dry Rubber	Wet Rubber (Dry Weight)
Banka and Billiton	46	....
British North Borneo	796	7
Brunei	15	6
Dutch Borneo	2,382	102
French Indo-China	194	....
Java	241	54
Other Dutch Islands	74	3
Rhio Residency	661	23
Sarawak	2,665	12
Siam	607	....
Sumatra	7,826	3,594
TOTAL	15,507	3,801

Malayan Union Imports from

Burma	140	4
Siam	5,021	102
Sumatra	1,164	1,037
TOTAL	6,325	1,143

Dealers' Stocks—January, 1947

Dry rubber	59,032
Wet rubber (estimated dry weight)	9,522
Latex	14
TOTAL	68,568

Stocks—January 31, 1947

Estates	19,406
Dealers	68,568
Harbor board (wharves and lighters)	542
Malayan railways (godowns)	10,226
Other port stocks	7,941
TOTAL	106,683

Production—Malayan Union—January 1947

Estates	25,822
Small holdings (estimated)	26,748
TOTAL	52,570

Compounding Ingredients Price Changes and Additions

Antisol	*lb.*	$0.23	/$0.24
Dielex-B	*lb.*	.06	
Herron-H.T.	*gal.*	.17	/ .23
Herron-Plas	*lb.*	.035	
Herron-Seal	*lb.*	.1125	/ .13
Herron-Wax	*lb.*	.045	
No. 6	*lb.*	.045	/ .0475
8	*lb.*	.0475	/ .05
Magnesia, Calcined			
Extra light, U.S.P.	*lb.*	.28	/ .31
Light, technical	*lb.*	.22	/ .28
No. 101	*lb.*	.175	
Heavy, technical	*lb.*	.05	/ .31
Medium light, technical	*lb.*	.175	
Silical	*ton*	37.00	/55.00

Trade Lists Available

The Commercial Intelligence Division of the United States Department of Commerce, Washington, D. C., recently compiled the following trade lists, mimeographed copies of which may be obtained by American firms from this Division at $1 a list for each country.

Automotive Equipment Importers and Dealers—Barbados; Czechoslovakia; Iraq; Bermuda; Egypt and Cyprus; Portugal.

Boot and Shoe Manufacturers—Venezuela; Guatemala.

Chemicals Importers and Dealers—British Honduras; Haiti; Australia; Ireland; Syria and Lebanon; Iran.

Dental Supply Houses—Czechoslovakia; Union of South Africa.

Electrical Supplies and Equipment Importers and Dealers—Czechoslovakia; Egypt and Cyprus; Venezuela.

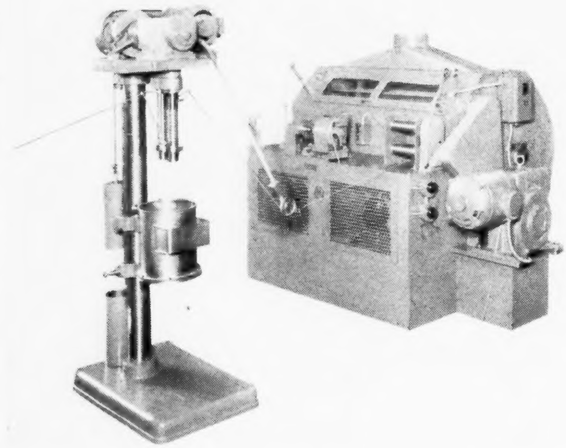
Rubber Goods Manufacturers—Turkey; Union of South Africa; Uruguay; Burma; Ireland, Nicaragua; Venezuela.

Sporting Goods, Toys and Games Importers and Dealers—Turkey.

Synthetic Organic Chemicals Manufacturers—India; New Zealand; Union of South Africa

Ap

New Machines and Appliances



Howe's Liconormer for Treating Light Cords

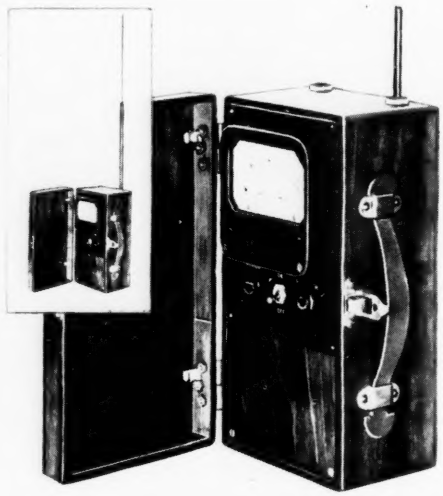
Cord Impregnating Machine

THE LICONORMER, a new machine for treating light cords, has been announced by the Howe Machinery Co., Inc., 30 Gregory Ave., Passaic, N. J. The function of this machine is to impregnate the cord fiber with latex or any other solution, improve the tensile strength, remove the stretch, thoroughly dry, and level wind the cord for further processing. Special design features, such as aluminum castings, anti-friction bearings, magnetic slip clutch wind-up, and others, make this machine especially suitable for the processing of low tensile strength materials, from two pounds and up in wet breaking strength.

The machine is comprised of three units. The latexing unit consists of a pair of driven grooved spindles mounted vertically in the tank containing the latex or other solution. Excess liquid will be thrown from the cord by centrifugal force before leaving the tank. The normalizing unit incorporates a pair of grooved conical rollers which will remove a predetermined amount of stretch from the cord. The number of grooves about which the cord is threaded determines the amount of stretch that will be removed. As the cord moves from the normalizer, it enters the drying unit where, still under tension, it is thoroughly

dried by large volumes of high-velocity heated air from the two blower units mounted under the normalizing rolls. The cord travels helically to the left and leaves the drier to be level wound by the magnetic slip clutch mechanism. This type of clutch permits adjustment of cord tension during winding and prevents the cord from breaking. Exhaust air is removed from the machine by a vent on top.

The complete drier and normalizer has a capacity of 300 feet per minute. It is 61 inches wide, 47 inches long, and 52 inches high and weighs 1,500 pounds. It has a 1/6 h.p. windup motor, a $1\frac{1}{2}$ h.p. main drive motor, and a magnetic starter with push button control. The latexing unit also has a capacity of 300 feet per minute. It is 18 inches wide, 24 inches long, and 57 inches high and weighs 300 pounds. It has a $\frac{1}{2}$ h.p. motor and a manual-type starter.



Davis Statometer with Air Terminal

Static Electricity Detector

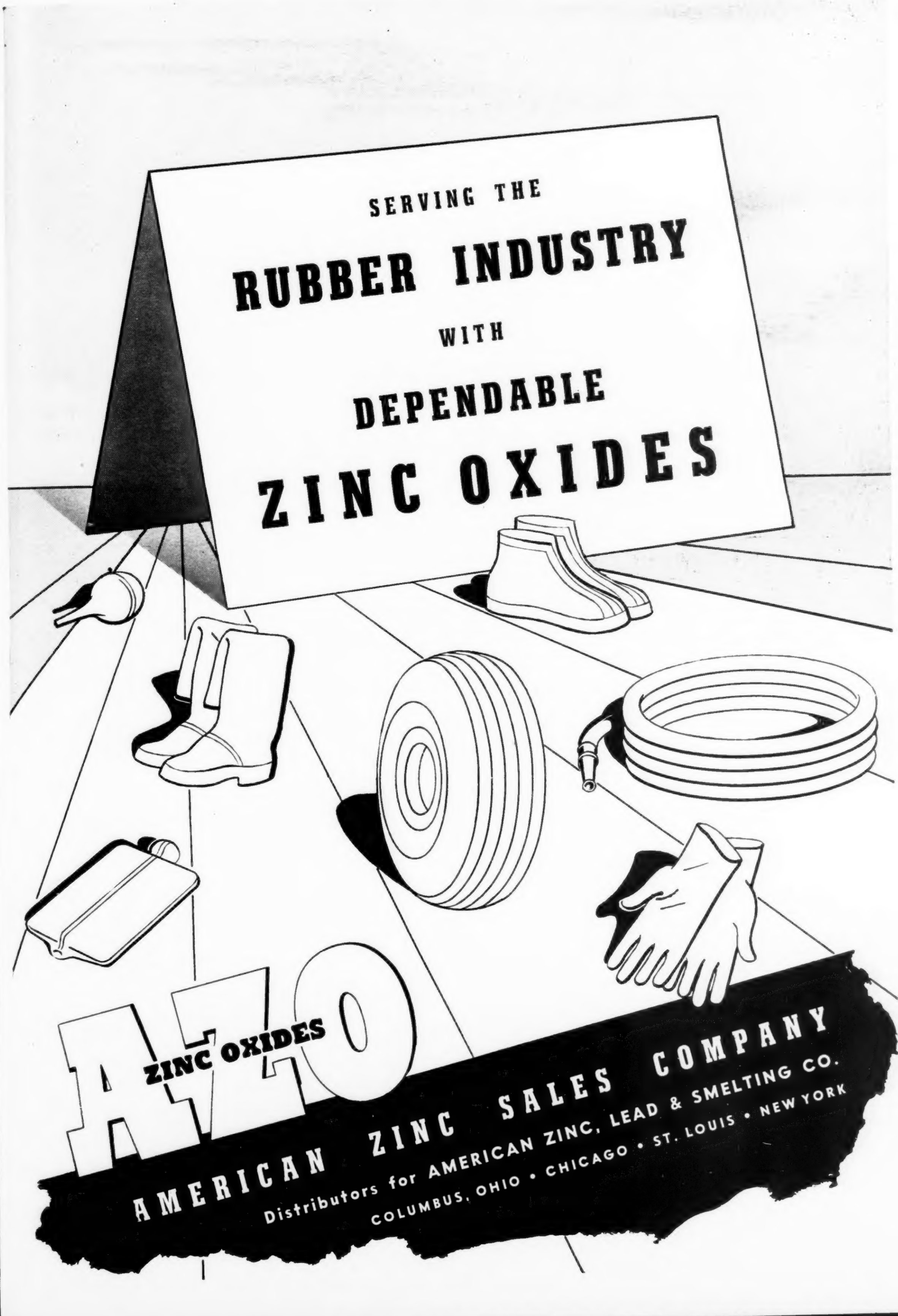
THE Statometer, a new portable, self-contained electric instrument designed to aid in the study of electrostatic conditions, has been announced by the Davis Emergency Equipment Co., Inc. The meter of this instrument, which is calibrated in terms of static volts, is claimed to be sufficiently sensitive to detect static charges in the order of fractional volts, both negative or positive. The device is provided with a two-position scale range switch, and it is possible to measure any voltage from 0 to 750 volts.

There are two sockets on top of the instrument in which an air terminal is inserted; one socket is used for detecting negative charges, and the other socket for postive charges. Operation of the Statometer is stated to be extremely simple. The operating switch is turned on, and the range switch turned to the low range position and balanced to zero. As the operator comes into the vicinity of a body charged with static electricity, the needle of the meter will begin fluctuating. The range switch is then turned to the high-range position, and the meter needle will move higher on the scale as the operator comes closer to the charged body. This procedure is followed for both negative and positive charges.

The instrument measures both above and below the sparking voltage and is fast in operation. Its low input capacity and high input resistance contribute to the accuracy and reliability of the readings obtained and provide a true evaluation of the static charge up to 750 volts. The instrument is $10\frac{3}{4}$ inches high, $4\frac{3}{4}$ inches deep, and six inches wide and weighs five pounds, 10 ounces.

Plastic Heating Unit

A NEW inexpensive heating unit that is said to give promise of answering practically all present plastic heating problems has been announced by the Castaloy Corp. Called the Vacu-


SERVING THE
RUBBER INDUSTRY
WITH
DEPENDABLE
ZINC OXIDES
AZO
ZINC OXIDES
AMERICAN ZINC SALES COMPANY
Distributors for AMERICAN ZINC, LEAD & SMELTING CO.
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

Castaloy's Vacu-Therm Generator Heating Unit

Therm generator, it is a war-proved veteran made to specifications so rigid that it operated efficiently under the jar of 16-inch guns. A thoroughly tested product, it gives industrial and domestic users a method of producing quick, controlled heat up to 550° F. with a tolerance of ±5% under low operating pressures.

The Vacu-Therm generator is a heavily insulated, self-contained unit with no moving parts, engineered to give long, trouble-free life. It has no motors, pumps, or gaskets. All controls are easily accessible in a panel enclosure on one end of the unit. The heat transfer medium used is Dowtherm E, and it is sealed in a heavily welded vacuum chamber. This liquid vaporizes when it reaches its efficient operating range, and transfers heat to the operation through flexible tubes or pipes. Dowtherm E is recognized as an inhibitor of rust and corrosion in the vapor system and adds to the long life and trouble-free operation of the unit.

One of the unit's outstanding features is its low pressure operation. For example, normal operating temperatures as high as 400° F. require only 15 psi. pressure, which eliminates the danger and maintenance cost of high-pressure equipment. The unit is closely controlled by means of efficient pressure-stats. The generator is presently manufactured in three sizes of 16, 22, and 33 kw. capacity. Floor space required is 72 inches long by 36 inches wide and 50 inches high. The unit's mobility makes stationary anchoring unnecessary. Operation is simple; the unit is installed by connecting it directly with the job through flexible tubes or pipes. It is then plugged in and ready to operate.

Synthetic Latices

(Continued from page 68)

ical agents. Because of their low film strength, they do not lend themselves to most latex processes, where this property is important.

The regular sulfur-accelerator type of compounding for rapid cure as used with *Hevea* and most synthetic latex is not applicable to "Thiokol" latex. Five to 10% of zinc oxide is the essential ingredient for cure. Vulcanization accelerators do not aid in cure, but some improve its film forming properties. Best cures are obtained under pressure with temperature being reduced before release of the pressure to prevent porosity. "Thiokol" latex may be compounded with fillers, thickeners, etc. as with *Hevea* and other synthetic latices.

Most applications of "Thiokol" latex are those whereby the compound may be applied by spreading, painting, spraying, or impregnating. This latex is particularly adaptable to tank linings where high solvent resistance is required and odor is no objection.

FAR EAST

CEYLON

Report on Research Work

The report of the work of the Rubber Research Board of the Rubber Research Scheme (Ceylon) during 1945 has just come to hand and includes a short summary of the work of each department compiled by the officer concerned.

The chemist, M. W. Philpott, gave details of the work that has been done in Ceylon in connection with the variability of *Hevea* rubber. He points out that though this question has been studied from the earliest days of rubber growing, the causes of variation are still only vaguely understood. Even so, he adds, enough is known to indicate the lines along which estate technique should develop to achieve greater uniformity, but rubber growers are not yet willing to undertake the reorganization of methods which most plantation technologists would advise. Recognizing that in these circumstances, continued research to eliminate variability was of questionable value, investigators have begun to exploit the idea of deliberately accentuating instead of suppressing natural variations with the aim of thereby producing special types of rubber superior to normal rubber for particular uses.

As a first step in the new direction, the chemical department during 1944 and 1945 began to examine samples from selected families, from mother trees and their offspring and from a large number of unselected seedlings, and to classify them according to their hardness index (D 10), measured by the parallel-plate plastometer. A random group of 843 unselected seedlings on Gallawatta Estate was the first to be tested. Results indicated that in any mixed seedling stand, one could expect to find trees yielding rubbers whose hardness values differed among themselves by at least 100%: the hardest samples were extremely tough; while the softest resembled lightly masticated normal rubber. Studies were then extended to a group of seedling trees grown from seed of fully and partly known parentage from the Prang Besar Isolation Gardens in Malaya. Here a survey of plasticity variations revealed that even a legitimate family whose members have a common parentage may exhibit as much variation as a mixed seedling population; which point suggests that breeding is not likely to be a practical means of securing particular latex properties.

Quite different results were obtained when mother trees and their offspring were studied; the correlation of mean clonal hardness with parent seedling hardness proved to be of a high order, and it is assumed that hardness, and hence any property associated with it, is genetically controlled, that rubbers obtained from the individual members of a single clone will be substantially uniform in properties, and that any intra-clonal variations that may occur will be largely due to secondary factors as soil, stock influence, pathological conditions, and tapping history.

Tests to determine the relation between plasticity and dry rubber content (D.R.C.) showed that most hard rubbers came from latices with high concentration and *vice versa.* But since there was also an instance of a hard rubber obtained from a latex with a particularly low D.R.C., high latex concentration cannot be regarded as an essential condition for the production of hard rubber. However the most positive evidence of association of concentration and plasticity was provided by the data from the Gallawatta trees, and the corresponding linear regression could be written:

$$\text{D.R.C.} = 3.99\text{D }10 + 21.36$$

where D 10 is expressed in millimeters and D.R.C. in grams for rubber per 100 cubic centimeters of latex.

No relation was found between plasticity and yield.

Where trees were tapped with two cuts at different levels, the high cuts tended to give harder rubber than that from the lower cuts. Factors which depress the D.R.C. of the latex in the tree (rainfall, for instance) were also found to depress the hardness of the rubber and *vice versa.*

Touching the subject of stress-flow variations, which it was suggested reflect deep-seated differences in the rubber hydrocarbon, Mr. Philpott states that a limited extension of earlier work on the problem was undertaken in connection with the present investigation. The earlier work had for its purpose to discover whether compression-time relations could be represented in a manner to elucidate the true rheological properties of the material and provide a basis for the rational classification of rubbers. So far results have not been very conclusive. Most of the work was based on Scott's classical analysis of compression-

flow data, but attention was also given to Williams' empirical equation and (following Buist and Seymour) to the application of the Scott Blair-Nutting equation.

These equations fitted the data with a fair degree of accuracy, but the numerical value of the constants was found to depend largely on the conditions of the tests. However, when testing conditions were made strictly comparative, useful results emerged. Thus it was shown that "naturally soft rubber was not rheologically equivalent to normal rubber softened by mastication; at 100° none of the rubbers examined, whether raw or masticated, exhibited a yield value; the temperature dependence of viscous flow for all *Hevea* rubbers in the range of 70 to 120° led to a calculated value of 12+2 k.cals. for the energy of activation."

This work, Mr. Philpott added, incidentally led to the conclusion that despite the limitations of the parallel-plate plastimeter, its possibilities have not yet been fully explored or exploited.

In his report Mr. Philpott also considers estate manufacture. To obtain uniform sheet, the best procedure would be to centralize production, calling for large-scale bulking of latex. But since latex tends to ferment and coagulate spontaneously, the scale of centralized production is limited by the time required to collect latex and to transport it to the central factory. There are, of course, various anti-coagulants, but none is entirely free from objection. Ammonia and formalin have the advantage of being volatile. Formalin produces quick-drying, soft, slow-curing rubber; while ammonia tends to increase hardness and rate of cure. Formalin also possesses antiseptic properties which have certain advantages in estate manufacture by preventing the formation of the common defects of smoked sheets, as bubbles, rust, mold.

Some investigators object to formalin on the grounds that it reduces the rate of cure and affects technical properties. On the other hand, so-called "USF Rubber,"[1] which undergoes prolonged contact with formalin, is claimed to be of exceptionally good quality. In tests at Dartonfield, formalin and ammonia treated rubbers showed no abnormality in aging qualities. It is concluded that the use of formalin as a preservative will allow the production of smoked sheet of first-quality appearance. But modern methods of evaluation will have to determine whether formalin treated rubber is technically inferior to standard rubber.

Mr. Philpott next calls attention to the fact that though the presence of bubbles in smoked sheet, caused by fermentation, is generally regarded as a defect to be carefully guarded against in estate procedure, some users have claimed technical superiority for bubbly (fermented) sheet, and, he adds, one large manufacturer even pays a premium for fermented sheet prepared by a special method.

A series of laboratory and factory-scale trials was carried out at Dartonfield to review known procedures for making fast-curing fermented sheet commercially, and early conclusions by Eaton and his co-workers on the promotion and prevention of maturation was confirmed, but the additional fact was brought out that there is an optimum temperature for maturation at 40° C.

The early workers demonstrated the fast-curing properties of simple fermented rubber-sulfur mixes. At Dartonfield it was shown that fermented rubber in a standard M-B-T test mix and a M-B-T gas tubing mix has fast-curing (high modulus) characteristics. On the other hand, fermented rubber in the presence of diphenylguanidine cured more slowly than normal rubber.

[1] British patent No. 549,162. See also *Ind. Eng Chem.*, Nov. 1942, p. 1335.

In view of the renewed interest in fermented sheet, the author suggests that it might be opportune to subject this type of rubber to a comprehensive technological investigation with particular reference to its interactions with reinforcing agents and different types of accelerators.

T. E. H. O'Brien Resigns

The director of the Rubber Research Scheme (Ceylon), T. E. H. O'Brien, resigned his post in July, 1946, owing to ill health. Mr. O'Brien, who joined the Rubber Research Scheme as chemist toward the end of 1921, was appointed director in January, 1932, when the newly reorganized institution, renamed Rubber Research Scheme (Ceylon), took over the assets and staffs of the former Research Scheme. M. W. Philpott, who had taken charge during the greater part of 1945 when Mr. O'Brien was on sick leave, was appointed acting director, and he combines the duties of chemist and director until a new permanent director is installed.

INDO-CHINA

Conditions on the rubber plantations in Indo-China, though on the whole reportedly tending to improve, are still highly unsettled. While in some sections lack of labor, shortage of adequate means of transportation, and the high cost of living hamper progress, in others it is the hostility of the natives. For instance, a report from the plantations of the *Société des Heveas de Tayninh* states that three members of its European staff were recently killed while carrying out their regular duties. This company seems now to have no difficulty about obtaining the number of coolies it requires, but if the European staff is further endangered, it may have to close down. As it is, Europeans can only travel in safety to Saigon if they join a military convoy, and European staff members cannot even make the rounds of the estate unless escorted by French soldiers.

Where similar conditions do not obtain, a certain measure of progress is noted, which is reflected in the statistics of rubber production. During the latter half of 1946 outputs were increasing to a level corresponding to 30 to 40% of prewar, and the estimated total for the whole year is figured at 20,000 metric tons. It is expected that total outputs in 1947 may reach 35,000 tons.

PHILIPPINE ISLANDS

On January 2, 1947, the $300,000,000-peso Philippine Rehabilitation Finance Corp. began to operate with the object of launching a broad program for economic reconstruction and expansion. It will grant loans to government agencies for various rehabilitation schemes, including, among others, the purchase and subdivision of large estates.

This latter project recalls to mind that it was precisely the policy of the Philippine Government of limiting the size of plantations that prevented rubber-growing here from expanding as it might have done if these limits had not been imposed. As it is there have never been more than a very few plantations of any importance here; according to reports issued at the end of last year there were then still only three estates of any considerable size, one in the north of Zamboanga, and two on the island of Basilan, which latter plantations had an area of about 1,000 acres each with total production of about 65 short tons of dry rubber per month.

These rubber plantations would probably be among the large estates whose purchase and subdivision the Philippine Rehabilitation Finance Corp. would finance. The thought comes to mind that, if the estates were indeed cut up into small units and worked more or less as a side line and after the methods followed by native small-holders in Malaya and Netherlands India, the rubber industry might just possibly be stimulated as never before —always provided the demand for natural rubber continued to be good for a sufficiently long time.

Since the end of the war the rubber produced in the Philippines has been bought by the Rubber Development Corp., but before the war it was sold chiefly to manufacturers (mainly of rubber-soled canvas shoes) in Manila. Incidentally, latest reports state that three factories of rubber-canvas shoes have just resumed operations on a small scale.

AUSTRALIA

Among the firms which, according to the Australian Minister for Postwar Reconstruction, intend to establish new or expand existing industries in Australia are listed the American firms, Rubtex Elastic Co., Pty. Ltd., and the Firestone Tire & Rubber Co.

Rubber needs of Australia, it is revealed, have increased by 25% over the prewar figures, but little, if any, synthetic rubber is now being used in the production of rubber goods. Some lines, as bicycle tires, for instance, are now being made in prewar qualities.

Australia is suffering from a shortage of several kinds of rubber goods including transmission belting, rubber flooring and matting and rubber sand shoes. Full supplies of the latter goods are not expected to be available for about another two years.

During the year ended June 30, 1946, Australia imported 8,350 long tons of crude rubber, value £1,593,000, in addition to 6,680,000 pounds of synthetic elastomers, value £550,000, and 2,373,000 pounds of compounded rubber. All but 300 tons of the crude rubber was supplied by Ceylon, and all the synthetic and compounded rubber came from the United States.

Imports of rubber manufactures into Australia included 729,000 pounds of pneumatic tires, value £102,000, and elastic webbings and bands, value £117,000, all from the United Kingdom.

Solid rubber practice golf balls have been put on the market by the Campbell Golf Ball Co., Sydney.

EUROPE

GREAT BRITAIN

Preparation and Packing of Rubber

Now that natural rubber is again arriving in quantity, the question of the most suitable form of preparation and packing once more comes to the fore. The views of British rubber manufacturers are contained in a report on post-war preparation and packing of rubber, issued following a conference of rubber manufacturing and trade organizations called in 1944 by the London Advisory Committee for Rubber Research (Ceylon and Malaya). This report indicates that most rubber manufacturers agreed that the bulk of rubber should continue to be in the form of ribbed smoke sheet. It was also suggested, however, that new types for special purposes might be developed as: softened rubber, purified rubber, carbon black-rubber mixtures similar to the synthetic rubber-carbon black mixtures.

Methods of packing still called for much criticism. The "Bareback" bale was considered the best at present, but even this form had its objections. Some manufacturers suggested that natural rubber be shipped in smaller packages as was done in the case of GR-S sent from America.

Since the 1944 conference the advantages of the latter method of shipping rubber have apparently become more generally recognized, for Bulletin No. 1—1947, of the Rubber Growers' Association, notes the receipt of a letter from the Federation of British Rubber Manufacturers' Associations which suggested a change in baling rubber based on its experience with synthetic rubber. The Federation stated that it had felt much benefit in receiving synthetic rubber in bales of 50 pounds, wrapped in brown paper, and suggested that in baling natural rubber "a suitable division should be arranged so that the bale could be made up of smaller bales of 50 pounds."

A similar letter was also sent to the Rubber Trade Association.

British Imports and Exports of Rubber

Latest Board of Trade returns reveal that the United Kingdom imported 299,613 tons, value £42,073,000, of raw rubber, gutta percha, and waste, reclaimed, and synthetic rubber during 1946,

contrasted with 68,298 tons, value £11,659,000, in 1945, and 172,612 tons, value £11,503,000, in 1938. Of this, raw rubber (including crepe and latex) accounted for 282,388 tons, value £40,026,000, in 1946, against 40,151 tons, value £5,341,000, in 1945 and 168,172 tons, value £11,291,000, in 1938. Exports of raw rubber and allied materials totaled 48,571 tons, against 5,386 tons in 1945 and 36,455 tons in 1938.

The 1946 exports further included: pneumatic tires for motor vehicles, 844,529 units, value £5,865,958; motor cycle and tricar outer covers, 34,227 units, value £57,226; cycle tire covers, 1,449,920 units, value £321,014; motor cycle, tricar, and cycle inner tubes, 1,257,975 units, value £138,469; other motor vehicle inner tubes, 705,741 units, value £675,350; 23,905 solid tires, value £45,670; unspecified rubber manufactures to a value of £5,550,862; 998 tons of rubber and canvas machinery belting, value £658,737; footwear items incorporating rubber, £920,114; 3,672,004 rubber-proofed and other macintoshes, oilskins, etc., value £2,554,295; golf and tennis balls, value £141,251; synthetic resins, £2,953,269; asbestos manufactures, £3,386,582; reclaimed and waste rubbers and synthetic rubber substitutes produced in the United Kingdom, 39,172 tons, value £831,878. The latter figures compare with 9,108 tons, value £295,703, in 1945 and 18,924 tons, value £227,256, in 1938.

Rubber Industry Notes

At the beginning of this year Lt.-Col. B. J. Eaton, O.B.E., retired after 40 years in the rubber industry. Colonel Eaton who was born in Dorchester in 1883, began his career in Malaya in 1906 as government chemist. He was three times Director of Agriculture in Malaya and early took a keen interest in the rubber industry, doing much valuable and pioneering research work on rubber in Malaya. His well-known manual, "The Preparation and Vulcanization of Plantation Para Rubber," produced in collaboration with his assistants, J. Grantham and F. W. F. Day, was published in 1918 and was the first authoritative work of its kind. In 1926, Colonel Eaton became head of the chemical division of the Rubber Research Institute of Malaya and director in 1930. He held this post until 1936 when he retired to England. Although in retirement he continued to take an interest in rubber and during the war took an active part in the industry again. At the end of 1941 he was appointed secretary of the Research Association of British Rubber Manufacturers. In that year, too, he received the Colwyn Gold Medal of the Institution of the Rubber Industry.

It is understood that within the next year or so, synthetic rubber will be manufactured on a large scale by British Geon Ltd., in its factory at Barry, Glamorgan. The B. F. Goodrich Co., Akron, O., U. S. A., and Distillers Co., Ltd., Edinburgh, Scotland, are interested in the new development. Chairman of the Geon company is Sir Waldron Sinclair, also chairman of the British Tire & Rubber Co., Ltd., which has close connections with the Goodrich company.

FRANCE

Laboratory Apparatus for Dipped Goods

A new laboratory apparatus for the manufacture of dipped goods from latex recently was perfected by J. Lescuyer, who claims several improvements for his device over the usual models.

The type of dipping machine used in France generally consists of two superposed shells, one of which holds a tank containing the latex which must be kept cold and protected from currents of air; while the other, cylindrical in shape and communicating with the first by means of a two-leaved door, contains a movable mold-rack and is provided with two other openings which permit the circulation of a hot and dry current of air for drying or vulcanizing the films. When the forms are to be dipped, the latex tank is raised by means of the elevator on which it is mounted, but first the elevator must raise the communicating door-leaves; that is, it must travel an additional distance equal to the length of the leaves, whereby the amount of space the machine occupies is increased as well as the duration of the operation.

In the new apparatus, the space required by the machine is reduced by elimination of the two-leaved door, which is replaced by a swinging shutter having the form of a cylindrical section. This shutter, carried by the axle of the mold-rack, can block the communicating aperture between the two shells and is so devised that it only admits air for heating when the tank is closed off

The shutter has a control lever connected with an electrical switch to stop the motor while the communicating aperture is shut off.

Another improvement is the introduction of hydraulic means for raising and lowering the elevator at desired speeds; while a semi-automatic device permits the exact reproduction of a predetermined cycle of operations.

The mold racks are rotated at variable speed by means of a hydraulic motor; the molds themselves have been designed to be rotated slowly and to be inclined at a regulatable angle with respect to the dipping tank. Drying is effected by an electric air heater with blower, and several thermostats are provided for temperature regulation.

The machine, compact and of good lines, is 1.75 meters high, 1.60 meters long, and 1.25 meters wide and weighs only about 1,400 kilograms. The trays are 450 by 500 millimeters, with a maximum height of 400 millimeters. They permit 25 to 30 nipple molds or similar small objects to be placed on one face, or two to four molds of larger objects.

French Rubber Industry Notes

The rate of production of rubber manufactures during 1946 fluctuated to some extent from month to month, but on the whole showed good progress. During some months in the latter half of the year outputs of certain articles, including automobile tires, hose, belting, and rubber soles, were reportedly equal to and even above the average monthly output of these goods in 1938. However, in other lines, as footwear, surgical goods, and various mechanical goods, production fell below that of 1938; while the 1946 figure for the numerous unspecified articles lumped together as miscellaneous rubber products was far below that for 1938.

France's rubber needs for 1947 have been put at 75,000 tons; but stocks for the year are officially declared to be only 50,000 tons. It is hoped to be able to recover 10,000 tons in Indo-China, but imports will probably have to make up the difference. Meanwhile, it is learned, an order has already been placed in Canada for 6,000 tons of synthetic rubber.

The International Sample Fair, Lyon, to be held April 12-21, reported that early this year all space had already been rented although more than 4,500 square meters have been added since 1946. A special section is to be devoted to automotive vehicles other than those intended for industrial and commercial purposes. Among firms exhibiting are many from the United States, Great Britain, Switzerland, Belgium, the Netherlands, Sweden, Czechoslovakia, China, Algeria, Morocco, and Tunisia.

According to the French press, the Kleber-Colombes concern, hitherto under the control of The B. F. Goodrich Co., Akron, O., U. S. A., is to come under the financial control of the French group, Compagnie Electrique de la Loire et du Centre.

Use of Fatty Acids

(Continued from page 65)

fied fatty acids or soaps having a definite ratio of the various fatty acids present. Crystallized acids are quite satisfactory and uniform in their activity. For example, crystalline palmitic acid would be desirable in certain cases; while for others a crystallized high purity oleic acid free from polyunsaturates would be ideal. Improvement in crystallization processes and development of markets for the polyunsaturated acids obtained as by-products will help bring these things to pass. Proper economic analysis of the technological progress in the related fields will certainly determine the course of the future in this field.

I wish to express my appreciation for the assistance given by the scientists working on the B. F. Goodrich synthetic rubber program and for information obtained from the "Summary of the Soap Development Program for Government Synthetic Rubber," (June 28, 1944) as compiled by Oliver W. Burke, Jr.

Editor's Book Table

BOOK REVIEWS

"Butalastic Polymers. Their Preparation and Application. A Treatise on Synthetic Rubbers." Frederick Marchionna. Reinhold Publishing Co., 330 W. 42nd St., New York, N. Y. Cloth, $5\frac{3}{4}$ by $8\frac{1}{4}$ inches, 642 pages. Price, $8.50.

Mr. Marchionna, an examiner in the United States Patent Office, has produced an extensive compilation of published information on synthetic rubbers, based on the patent literature and listing more than 600 United States patents. The author attempts to summarize these patents as completely as possible, although warning the reader of the inaccuracies inherent in patent literature. As it stands, the book presents a great deal of detailed information on synthetic rubber research not otherwise readily available, but has two important drawbacks. The text consists of patent summaries grouped together according to chemistry, with little or no attempt made to evaluate either the different processes presented or the patents themselves for inconsistencies and relative importance. In addition, because of printing delays, the domestic wartime synthetic rubber program is given little attention. The latest patent or literature references in the book are for 1943, and there is no mention of the government rubbers, GR-S, GR-I, or GR-M.

In his introductory chapter the author introduces the word "butalastic" to describe the elastic or plastic polymers of butadiene and its derivatives, polymerized alone or with other materials. He divides the butalastics into 17 classes, according to the chemistry of the monomers. Although the rubbers are divided into logical chemical classes, the butalastic designations of the classes are somewhat confusing, and the reader finds himself constantly referring back to the original classifications for proper understanding of the text.

After a chapter on historical background, the book is divided into three parts. Part I is concerned with the sources and production of the monomers by various processes. The second part, which comprises almost half of the book, covers the mechanisms and processes of polymerization of different rubbers. The third part is devoted to the processing, compounding, vulcanization, fabrication, and applications of the butalastics. Besides author and subject indices, the book also contains a valuable index of polymerization catalysts.

"A.S.T.M. Standards on Textile Materials (with Related Information)." Prepared by A.S.T.M. Committee D-13 on Textile Materials. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. October, 1946. Paper, 9 by 6 inches, 490 pages. Price per copy: $3 to members, $4 to non-members.

This latest edition of textile standards contains 86 specifications, test methods, and tolerances covering a wide range of textile materials. Cotton is represented by 27 standards; while rayon and silk are covered by 11 standards. Six standards pertain to asbestos; ten cover wool; four are on bast and leaf fibers, and the balance are on general testing methods, definitions, etc. The book also contains a number of appendices, including basic properties of textile fibers; yarn number conversion table; proposed recommended practice for designation of yarn construction; psychrometric table for relative humidity; proposed recommended practice for calculating number of tests to be specified in determining average quality of a textile; proposed method of test for accelerated aging; proposed methods for determining clean wool content, and for evaluating "hand" properties of soft-finished woven fabrics; and American war standard specification and description of color.

NEW PUBLICATIONS

"Struthers Wells Rubber Cement Mixers." Bulletin No. 55W. Struthers Wells Corp., Warren, Pa. 4 pages. This bulletin describes the company's rubber cement mixers, available in four standard sizes and with one or two agitators, depending on capacity. Featured in the publication are diagrams showing the construction of the mixers and tables giving the working capacities and complete dimensions of the different models.

Publications of the British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Hertfordshire, England. **"Modern Views on the Chemistry of Vulcanization Changes."** Publication No. 72. 25 pages. "Part I. Nature of the Reaction between Sulfur and Olefins." By E. Harold Farmer and F. W. Shipley. Unaccelerated reaction between sulfur and simple monoolefins leads almost exclusively to cross-linking of the olefin molecules by groups of sulfur atoms. When two or more olefinic units occur in the same molecule, sulfur action results primilary in cyclization of the olefinic chains to form sulfur-containing rings. "Part II. Role of Hydrogen Sulfide." By Ralph F. Naylor. Results are given of a study of the reaction of hydrogen sulfide with olefins, including polyisoprenes, with special reference to reactive capacity in the presence of free sulfur. "Part III. Reaction of Sulfur with Squalene and with Rubber." By George F. Bloomfield. The reaction of squalene with sulfur is used to study the mechanism of rubber vulcanization. The efficiency of sulfur as a cross-linking agent during vulcanizaiton of squalene is shown to be of low order.

"Kinetic Studies in the Chemistry of Rubber and Related Materials. II. The Kinetics of Oxidation of Unconjugated Olefins. III. Thermochemistry and Mechanisms of Olefin Oxidation." By J. L. Bolland and Geoffrey Gee. Publication No. 74. 17 pages. In the first paper the production of an unsaturated hydroperoxide is shown to comprise a chain reaction initiated by the production of free radicals from the olefin. The second paper considers some possible alternative reactions of these free radicals on the basis of energy requirements for reaction. The structure of the olefin is shown to influence the relative ease of these processes and reactions.

"Firestone Farm Market Manual." Firestone Tire & Rubber Co., Akron, O. 76 pages. This new manual for tire and implement dealers contains complete information of the selection, handling, and maintenance of all types of farm tires. Contents include tire specifications for all tractors, combines and farm implements; instructions on change-overs, mounting and repairing of farm tires and tubes; data on tire construction, load capacities, recommended inflation pressures, and liquid weighting of tractor tires; information on retreading services; data tables on rims, batteries, and spark plugs; and discussions of Firestone's farm advertising and promotion activities.

"DC Antifoam A." Dow Corning Silicone Notebook, Compound Series No. 1. February, 1947. Dow Corning Corp., Midland, Mich. 4 pages. The physical properties of DC Antifoam A are described herein, together with information on methods of use, methods for determining its efficiency, and results of comparative studies showing its value when tested against other foam suppressors. The pamphlet also lists a number of industries in which the usefulness of the material has been established, including the synthetic rubber industry.

"Milton Roy Controlled Volume Chemical and High Pressure Pumps." Milton Roy Co., Philadelphia, Pa. 32 pages. This illustrated catalog describes the company's line of pumps, giving design features, operational data, and recommended applications. Besides a chart in color offers recommended materials of construction for use with some 168 different chemicals and reagents. Also included are plan dimensions, shipping weights, and capacity pressure charts for the various pumps.

"GE Insulating Varnishes." General Electric Co., Pittsfield, Mass. 40 pages. This booklet gives complete technical and application data on the company's insulating varnishes. Thirty-six varnishes of different types are discussed, and the data given cover specifications, electrical properties, film properties, cure and aging, chemical properties, and baking and air-drying cycles for each type of varnish.

"Organic Nitrogen Compounds." Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y. 31 pages. This booklet gives detailed information on the properties, specifications, and uses of the alkyl amines, alkylene amines, alkanolamines, and acetoacetarylamides. A bibliography of references to amines is also included.

"American Standards." American Standards Association, 70 E. 45th St., New York 17, N. Y. 24 pages. This is the latest list of the 864 standards approved for use by industry by the Association. The standards listed included definitions of terms, material specifications, work methods, and product tests for metallic and non-metallic materials. The field of rubber is represented by five testing methods and five product specifications.

"Phthalic Anhydride." Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 50 pages. Detailed information on the properties, purity, and performance of phthalic anhydride is presented herein, supplemented by many charts, tables, and illustrations. There are also sections on testing methods, a comprehensive list of products and applications, a chart of typical reactions, a bibliography on use of phthalic anhydride, and a table on properties of esters and other derivatives.

"Foreign Commerce and Navigation of the United States, Calendar Year 1944. Volume I—United States Import and Export Statistics." Section B, and Supplement. For sale by Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Prices $2.25 for Section B; $2 for Supplement. Section B of Volume I gives import and export statistics in country of origin and country of destination arranged according to commodity. The Supplement gives import and export statistics in commodities arranged according to customs districts.

"Tire Valve Converting Manual." Revised, November, 1946. A. Schrader's Son, division of Scovill Mfg. Co., Inc., Brooklyn 17, N. Y. 16 pages. This manual provides information on the changes in tire valve converting and replacement practice resulting from the development of the wide base rim and "W" tube for trucks and buses. By means of tables and diagrams the manual tells which valve to use for a specific rim and tube combination and shows how to make the correct first and second bends in the valve to fit the old and new rim designs.

"Pest Control Simplified." United States Rubber Co., Rockefeller Center, New York 20, N. Y. 20 pages. This booklet gives an extensive list of agricultural insects and diseases and suggests a remedial agent for each. Instructions are given for proper treatment of seeds, bulbs, and lawn turf and for spraying vegetables, flowers, trees, and shrubs. A discussion of weed killers is also included.

"Effect of Mixing Temperatures on Neoprene Tread Stock." BL-220. February 15, 1947. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 4 pages. Laboratory test data, charts, and formulations show that Neoprene GR-M tread stocks should be mixed at the lowest possible temperatures. The discharge temperature of Banbury-mixed stocks should not exceed 240° F. and should be kept well below this level if at all possible. The data indicate that high temperature mixing does not provide any advantages to compensate for the definite disadvantages of this method.

"The Chemistry of Fatty Acids." Armour & Co., 1355 W. 31st St., Chicago 9, Ill. 12 pages. This technical booklet should be of interest to all concerned with fatty acids or their derivatives. After an introduction on the sources and composition of fatty acids, there are tables giving the formulae and properties of both unsaturated and saturated fatty acids, together with a discussion of their chemistry. The chemistry of fatty acid derivatives is discussed in some detail, and information is presented on applications of these derivatives. An extensive bibliography of books and periodicals is appended.

"Specifications for Government Synthetic Rubbers." Effective January 1, 1947. Office of Rubber Reserve, Reconstruction Finance Corp., 811 Vermont Ave., Washington 25, D. C. 63 pages. This new edition of specifications incorporates the changes necessary to bring it into agreement with developments in the government synthetic rubber program. In the first section on specification limits, specifications for GR-S-38, GR-S-Black-1AC, and GR-A have been eliminated, and those for the newer rubbers added, including GR-S-16, GR-S-17, GR-S-60, GR-S-10-AC, GR-S 40-AC, GR-S-Black-2, and the five types of GR-S latices. Minor changes have been made in the specifications for the older GR-S types, particularly in maximum content of volatile matter. The second section, on sampling, now contains directions for sampling of the GR-S latices. The third section, "Chemical Methods," gives a new method for testing stabilizers. No changes have been made in the fourth section on physical methods except for deletion of the test for viscosity and gelling of GR-S solutions. A new fifth section on latex methods has been added and contains tests on total solids, residual styrene, total soap, pH, surface tension, turbidity, viscosity, and Mooney viscosity of the latex film. A new appendix on weight of total solids in tank cars has also been added.

"Latex Foam." Rubber Development Bureau, 1631 K St., N. W., Washington, D. C. 10 pages. This is a fact-summary on latex foam which discusses the properties of the material, how it is made, its uses and advantages, its availability and supplies, and the sources of the foam, giving the names and trade names of the six domestic manufacturers.

"List of Inspected Fire Protection Equipment and Materials." January, 1947. 189 pages. **"Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials."** February, 1947. 62 pages. Both from Underwriter's Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. **"Protecting Men at Work."** Industrial Accident Prevention Associations, Inc., Toronto, Ont., Canada. **"Converse Handball Handbook."** Converse Rubber Co., Malden 48, Mass. 30 pages.

BIBLIOGRAPHY

General Documentation at the French Rubber Institute. S. Reizler, *Rev. gen. caoutchouc*, 20, 210 (1943).

Analysis of Some National Rubber Plants. O. Fernández, G. Izquierdo, *Farm. nueva (Madrid)*, 9, 375 (1944).

Determination of the Rubber Content of *Euphorbia cespitosa*. R. Nico, *Rev. facultad, cienc. quim.*, 18, 7 (1943).

The Importance of Glycerol in the Rubber Industry. J. Duval, *Rev. gen. caoutchouc*, 20, 182 (1943).

The Importance of Benzene and Its Derivatives in the Rubber Industry. J. Prelaz, *Rev. gén. caoutchouc*, 20, 143 (1943).

Direct Determination of the Hydrocarbons of Rubber. J. R. Pucci, F. J. Maffei, *Anais assoc. quím. Brasil*, 4, 65 (1945).

Lead in the Rubber Industry. L. Graffe, *Rev. gén. caoutchouc*, 20, 214 (1943).

Elastothiomers—Elastic Synthetic with Special Properties. R. Coomans, *Rev. gén. caoutchouc*, 20, 139 (1943).

Depolarization of Light Scattered in Solutions of Rubber-Like Polymers. V. N. Tsvetkov, E. Frisman, *Compt. rend. acad. sci. U.R.S.S.*, 47, 550 (1945).

Proportion of Crystalline and Amorphous Components in Stretched Vulcanized Rubber. A. J. Wildschut, *J. Applied Phys.*, 17, 51 (1946).

Lignin-Base Plastics. G. Coppa-Zuccari, *Inds. plastiques*, 1, 142 (1945).

Chemical Resistance of Gasket Materials. *Chem. Eng.*, Nov., 1946, p. 106.

Chemical Resistance of Constructional Metals and Non-Metals. *Chem. Eng.*, Nov., 1946, p. 120.

Rubber in Malaya and British Borneo. E. G. Holt, *Foreign Commerce Weekly*, Oct., 1946, p. 4.

Wide Base Rims and Their Effect on Truck Design and Operation. *Automotive Aviation Industries*, Dec. 15, 1946, p. 38.

Ether Esters, Plasticizers for Vinyl Coating. F. J. Tuttle, E. B. Kester, *Modern Plastics*, Dec., 1946, p. 163.

Some Recent Contributions to Synthetic Rubber Research. C. S. Fuller, *Bell System Tech. J.*, July, 1946, p. 351.

Aqueous Emulsion Polymerization. M. Sana, *Rev. gén. caoutchouc*, 23, 8198 (1946).

Aqueous Dye Baths for Polyvinyl Chloride. R. Thiollet, *Rev. gén. Caoutchouc*, 23, 8205 6 (1946).

Continuous Process for GR-S Masterbatches with Non-Black Pigments. E. L. Borg, J. C. Madigan, S. L. Provost, R. E. Meeker, *Ind. Eng. Chem.*, Oct., 1946, p. 1013.

Evaluation of Blends of Guayule and GR-S Rubbers. F. E. Clark, W. F. L. Place, *Ind. Eng. Chem.*, Oct., 1946, p. 1026.

State of Cure of Neoprene Vulcanizates. D. B. Forman, R. R. Radcliff, *Ind. Eng. Chem.*, Oct., 1946, p. 1048.

Role of Carbon in Oxidation of GR-S Vulcanizates. H. Winn, J. R. Shelton, D. Turnbull, *Ind. Eng. Chem.*, Oct., 1946, p. 1052.

Correlation of Tensile Strength with Brittle Points of Vulcanized Diene Polymers. A. M. Borders, R. D. Juve, *Ind. Eng. Chem.*, Oct., 1946, p. 1066.

Determination of the Rubber Content of *Hevea* Leaves. G. J. Van Der Bie, *India Rubber J.*, Sept. 28, 1946, p. 3.

The Manufacture of Velon Monofilaments. O. P. Rowland, Jr., *Rayon Textile Monthly*, Oct., 1946, p. 64.

Plastics, Resins, and Rubbers. P. O. Powers, *Chem. Eng. News*, Oct. 25, 1946, p. 2784.

Technical Control Means Better Tire Cord. C. M. Bowden, *Textile World*, Nov., 1946, p. 122.

Metallurgical Progress and the Rubber Industry. *India Rubber J.*, Oct. 26, 1946, p. 3.

Banbury Mixers. *Dominion Engineer*, May, 1946, p. 2.

Morphological Studies of Balata. E. A. Hauser, D. S. le Beau, *India Rubber J.*, Oct. 5, 1946, p. 3.

Amberols Improve "Building Tack" of Synthetic Rubbers. *Resinous Reporter*, Nov., 1946, p. 6.

Dielectric Constants of Dimethyl Siloxane Polymers. E. B. Baker, A. J. Barry, M. J. Hunter, *Ind. Eng. Chem.*, Nov., 1946, p. 1117.

Mechanical Processing of Carbon Blacks. R. E. Dobbin, R. P. Rossman, *Ind. Eng. Chem.*, Nov., 1946, p. 1145.

Alkylphenol Sulfides as Vulcanizing Agents. G. M. Wolf, T. E. Deger, H. I. Cramer, C. C. DeHilster, *Ind. Eng. Chem.*, Nov., 1946, p. 1157.

Structure of Alkylphenol Resin Tackifiers for GR-S. G. E. P. Smith, Jr., J. C. Ambelang, G. W. Gottschalk, *Ind. Eng. Chem.*, Nov., 1946, p. 1166.

Chemical Derivatives of Synthetic Isoprene Rubbers. J. D. D'Ianni, F. J. Naples, J. W. Marsh, J. L. Zarney, *Ind. Eng. Chem.*, Nov., 1946, p. 1171.

The Solvent Properties of Methyl Isobutyl Ketone. J. R. Scheibli, T. W. Evans, *Paint, Oil, Chem. Rev.*, Oct. 31, 1946, p. 12.

Swelling of Rubber. III. F. S. and K. S. Rostler, *Rubber Age (N. Y.)*, Oct., 1946, p. 57.

Some New Applications for Glycerine in the Overall Rubber Field. G. Leffingwell, M. A. Lesser, *Rubber Age (N. Y.)* Oct., 1946, p. 69.

Unsaponifiable Chlorinated-Rubber Paint Films. J. F. H. van Eijnsbergen, *Paint Tech.*, 10, 319 (1945).

The Growth and Rubber Content of Guayule as Affected by Variations in Soil Moisture Stresses. A. S. Hunter, O. J. Kelley, *J. Am. Soc. Agron.*, 38, 118 (1946).

Some Remarks Concerning Wickham and Fresneau. J. Le Bras, *Rev. gén. caoutchouc*, 20, 39 (1943).

AFRICA

Torr-Gericke Rubber, Ltd., recently was formed in Johannesburg to exploit a process for coagulating rubber latex. The firm has been granted exclusive world license for the process by agreement with the owners of the patent rights, the Research Corp. of South Africa (Prop.), Ltd. The new company intends to install units, on a royalty basis, on plantations in Belgian Congo and eventually also on plantations in Malaya, Sumatra, Java, and other rubber producing centers.

During 1946, production by Dunlop, South Africa, Ltd., the largest rubber factory here, is said to have been twice that of 1939 and five times the original estimated output of the factory. This considerable expansion has necessitated the erection of new facilities including additions to the main factory, an administrative block which will also house the laboratories and technical department, railway sidings, loading platforms, a road, and bridges. The construction program, said to cost £350,000, is nearing completion, and most of the new, up-to-date equipment, which has been arriving since the end of the war, has been installed.

Market Reviews

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

Futures	Jan. 25	Feb. 22	Mar. 1	Mar. 8	Mar. 15	Mar. 22
Apr.	30.07	33.56	33.92	34.77	35.11	35.56
June	28.91	32.13	32.38	33.18	33.55	34.13
Aug.	27.42	30.25	30.55	31.29	31.51	32.24
Oct.	26.02	28.35	28.81	29.50	29.45	30.20
Dec.	25.42	27.44	28.02	28.73	28.65	29.40
1948						
Feb.	25.09	27.10	27.68	28.43	28.30	29.00

A STEADY and optimistic cotton market last month saw both spot and future prices rise. From a price of 34.80¢ on March 1, cotton spot quotations rose to a monthly peak of 36.75¢ on March 28 and, closed at 36.39¢ on March 31. The April futures price followed along, starting at 32.58¢ on March 1, rising to the peak of 35.15¢ on March 29, and closed at 34.87¢ on March 31.

Factors influencing the rising market were: (1) the strong statistical position of cotton; (2) the steadiness of mill buying and their rapid consumption rate; (3) the increasing export demand, including anticipated UNRRA allocations; (4) speculative short coverings and new buyings based on delayed preparations in the South for the new season; (5) the report of the Exchange's Service Bureau that domestic stocks at the end of February were estimated at 7,888,000 bales, the smallest end-February stock since 1929; and (6) the report that the Congressional bill to extend the Commodity Credit Corp. until January 1, 1948, had been approved in committee.

The Bureau of the Census reported that 840,463 bales of cotton were consumed by domestic mills during February. Production during the current season was given as 8,513,489 running bales, the shortest crop since 1921 but some 200,000 bales more than the trade had foreseen on the basis of December estimates. Total 1947-48 cotton plantings were estimated at 19,723,000 acres, an increase of 8.5% over final harvested acreage of the current season, but some 3,377,000 acres below Department of Agriculture goals. This small increase is reported due to shortages of fertilizer and seed and the high cost of farm labor.

The grade index of the 1946 crop was estimated at 94.6, a level considerably higher than the previous year. The average staple length of 1 6/32 inches for 1946 was the longest on record, being 1 2/32 inches in 1945.

Fabrics

No weakness in the cotton fabric market was apparent during March, although there were some indications of mounting resistance to prices, especially for nearby deliveries. Sheetings continued in active demand, but there was some backing up of certain heavy drills and twills. The prices of wide sheetings and certain narrow goods were at such high levels as to hamper some needed lines. Demand was active for second and third-quarter goods, with little being offered. Important volumes of fourth quarter sales were made in an active market.

It was pointed out that certain large users of print cloths and sheetings are gradually getting better supplies of goods, a development which puts them out of the market as high bidders for substitute materials. As an example, with rubber companies able to secure better deliveries on such items as the 40-inch 56x56 3.60 yard and 40-inch 56x48 4.30 yard sheetings, the demand from these companies for quick delivery of the 40-inch 48x40 3.75 yard sheeting will diminish at 26¢.

Bureau of the Census statistics show 141,483,000 linear yards of tire cord and fabric to have been produced in the last quarter of 1946. This total represents an 11.1% increase over the third quarter of 1946 and a 25.7% increase over the corresponding quarter of 1945. Of this total, 85,036,000 linear yards were of cotton construction; while 56,447,000 linear yards were of rayon and nylon. Of the cotton types, 42,668,000 linear yards went into woven tire cord fabrics; 21,708,000, into chafer and all other tire fabrics; and 20,660,000 into non-woven tire cords. Of the rayon and nylon types, 50,589,000 linear yards went into woven tire cord and all other tire fabrics; while 5,858,000 linear yards went into non-woven tire cords.

RAYON

AS A result of new rayon gray cloth price increases, prices of finished goods may be expected to advance as much as 15%, particularly for the filament yarn weaves and the better grades of piled yarn gray cloths which are in active demand. With the consumer balking at higher prices and many houses strapped with large inventories of hard-to-move finished goods, distributers were pessimistic on future prospects of the industry. Anticipated increases in yardage for second-quarter rayon gray good allocations were not materializing. A few increases were noted, but these did not exceed 5%, and hopes that new constructions and loomage would be available were dashed.

Prices of the high-tenacity, tire-type viscose yarns were advanced 4¢ per pound by the largest producer. The prices of the 1100, 1650 and 2200 denier constructions are now 53¢, 52¢, and 51¢ per pound, respectively. These prices are now uniform for all producers, the 1¢-per-pound premium formerly charged on the 1650 and 2200 yarns by some producers having been eliminated.

Total domestic shipments of rayon in February totaled some 70,300,000 pounds, or 8% below January (owing primarily to the fewer working days). For the first two months this year, domestic deliveries of rayon amounted to 147,000,000 pounds, an increase of 10% over deliveries during the same period in 1946.

SCRAP RUBBER

THE scrap rubber market continues stagnant as reclaimers refuse to pay higher prices for scrap. The reclaimers insist that they are faced with competition from synthetic and plastic materials, so cannot afford to pay more. Scrap dealers maintain that the reclaimers are not buying because of expectations of greater available supplies of scrap tires late in the spring. Trading is generally very spotty. It is reported that larger dealers are refusing to absorb Butyl inner tubes, indicating that they will neither buy nor ship such materials. Some GR-S red stripe tubes are still being accepted, but in limited quantities.

Lower prices for tire and tube scrap were reported, with Akron prices off to $19 per ton for tires and $45 per ton for No. 1 natural peelings. Mixed auto tube prices dropped to 5.5¢ per pound in the East, and 5.125¢ per pound at Akron. Tire splitting operations are virtually at a standstill, with very little demand for peelings, particularly those of the synthetic grades.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered points indicated:

	Eastern Points	Akron, O.
	(Net per Ton)	
Mixed auto tires	$17.50	$19.00
Truck and bus tires	17.50	19.00
Beadless tires	23.00	25.00
S.A.G. passenger (natural)	17.50	18.00
(Synthetic)	nom.	nom.
Truck (natural)	15.50	16.00
(Synthetic)	nom.	nom.
No. 1 peelings (natural)	45.00	45.00
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 2 peelings (natural)	30.00	31.00
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 3 peelings (natural)	28.00	29.00
(Synthetic)	nom.	nom.
	(¢ per Lb.)	
Mixed auto tubes	5.5	5.125
Red passenger tubes	7.25	7.25
Black passenger tubes	6.25	6.25
Truck tubes	6.0	6.0
Mixed puncture-proof tubes	2.0	2.0
Aire brake hose	nom.	nom.
Rubber boots and shoes	nom.	nom.

Fixed Government Prices*

	Price per Pound	
	Civilian Use	Other Than Civilian Use
Guayule		
Guayule *(carload lots)*	$0.17½	$0.31
Latex		
Normal *(tank car lots)*	.29¼	.43½
Creamed *(tank car lots)*	.30	.44¼
Centrifuged *(tank car lots)*	.31	.45¼
Heat-Concentrated *(carload drums)*	.32¾	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.25¾	.40
1X Thin Pale Latex Crepe	.25¾	.40
2 Thick Pale Latex Crepe	.25¼	.39½
1X Brown Crepe	.24⅝	.38⅞
2X Brown Crepe	.24⅜	.38⅝
2 Remilled Blankets (Amber)	.24½	.38¾
3 Remilled Blankets (Amber)	.24⅜	.38⅝
Rolled Brown	.21¼	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.18½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26⅛
(Washed and dried)	.20¼	.37¾
Islands Fine (crude)	.14⅝	.28¼
(Washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24¾
(Washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(Washed and dried)	.18	.35½

*For a complete list of all grades of all rubbers see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

RECLAIMED RUBBER

THE reclaimed rubber market remains unchanged, with demand continuing in excess despite capacity production. The increasing receipts of natural rubber has had some effect in reducing demand for reclaim, but not enough to exert any depressing effect on the market.

Production of reclaimed rubber in 1946 totaled 295,612 long tons, a gain of more than 20% over the 1945 output of 243,309 long tons. Reclaim production was particularly high in the last quarter of 1946, averaging 25,456 long tons monthly, the highest monthly average for any three-months period since 1943.

The Rubber Section of the Commodity Service, United States Department of Commerce, has released statistics on monthly production, consumption, exports, and end-of-month stocks of reclaimed rubber in 1946. These figures are given below, togther with preliminary statistics for January, 1947. All figures are in long tons.

1946	Production	Consumption	Exports	Month End Stock
January	24,458	22,031	1,253	29,099
February	23,187	20,702	1,368	30,216
March	25,136	22,075	1,841	31,436
April	23,930	22,396	1,238	31,732
May	25,322	22,162	1,338	33,554
June	24,882	21,725	1,416	35,295
July	22,619	21,350	961	35,603
August	25,798	24,566	1,093	35,742
September	23,956	23,715	579	35,404
October	26,322	26,706	759	34,261
November	24,748	24,385	1,108	33,516
December	25,254	23,597	1,507	33,666
TOTAL 1946	295,612	275,410	14,461	.....
1947				
January	25,584	26,061	1,443	31,746

Reclaimed Rubber Prices

	Sp. Grav.	¢ per Lb.
Auto Tire		
Black Select	1.16-1.18	7¼ / 7¾
Acid	1.18-1.22	8½ / 8¾
Shoe		
Standard	1.56-1.60	8 / 8¼
Tubes		
Black	1.19-1.38	12 / 12½
Gray	1.25-1.26	13 / 14
Red	1.15-1.32	13 / 13½
Miscellaneous		
Mechanical blends	1.25-1.50	5½ / 6½

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

I. J. Karpman, representing "Haspakah," Palestine Supply Co., Ltd., 43 Wolfsohn St., Tel Aviv, Palestine: cables: electric wire, automotive parts.

Ramon Palermo, representing Passeggi & Co., Ave. 18 de Julio 2025, Montevidio, Uruguay: tires and vehicle accessories.

Wilfrid Smith, Ltd., 16 Philpot Lane, London, E.C.3, England: products used in the rubber industry.

Georges Ibr. Saad, representing Ibr. J. Saad & Fils, Souk-el-Jameel, P. O. Box 66, Beirut, Lebanon: automobile parts and tires: refrigerators.

Roger S. Berry and Dr. L. A. Bushell, representing Plastics Products (Pty.) Ltd., 610 Surrey House, Rissik St., P. O. Box 4527, Johannesburg, Union of South Africa: industrial chemicals, plastic raw materials, and fabricated products.

Mark Lipworth, chairman, Alex Lipworth (Pty.) Ltd., 70 Simmonds St., P. O. Box 4461, Johannesburg, Union of South Africa: druggists' sundries.

Gustave Goldberg & Fils, 18-20 Rue Limnander, Brussels, Belgium: boot and shoe machinery: supplies and accessories for shoe making and repairing.

L. Laroche & Co., 21 Rue de la Bourse, Antwerp, Belgium: commercial resins.

Costa Rican Sales Agents Ltd., P. O. Box 785, San Jose, Costa Rica: household electrical appliances: plastic screening: plastic novelties.

E. Gosschalk, representing Fa. Herman Gosschalk, 379 Prinsengracht, Amsterdam, C., Netherlands: combs: sponges: plastics: plastic sheet for curtains: adhesive tape.

F. W. Chapman, 11 Roslin Ave., Toronto 12, Ont., Canada: pigments, emulsifiers, and resins for rubber manufacturers.

A. Piras & Co., 5 Via Garibaldi, Genoa, Italy: cotton, rubber oilseeds.

Kian Gwan Co. (Thailand), Ltd., 9 Ma'serenetharam Rd. (Post Box 21), Bangkok, Siam: tires and tubes.

A. Magasanik, 19-A Upplandsgatan, Stockholm, Sweden: toys of rubber, plastic, and paper.

André Garteiser, representing Cie. Générale d'Électricité, 54 Rue La Boetie, Paris, France: wire and wire coverings.

Renzo Callinatti, 105 Via Frejus, Turin, Italy: automobile tires and tubes.

Elie Mizrahi, representing Mizrahi Frères, P. O. Box 26, Damascus, Syria, and P. O. Box 646, Beirut, Lebanon: radios and electrical appliances: electric refrigerators: storage batteries: automobile and truck tires.

Sesto Meucci, representing Soc. Anon Meucci Frneo & Figli, Via Guido Monaco 29, Florence, Italy: rubber and related products: synthetic crude and reclaimed rubber used in the manufacture of tires: synthetic rubber: scrap rubber, especially old inner tubes: reclaimed rubber: linings of airplane gasoline tanks.

George Sabra, representing United Trading Co., P. O. Box 395, Rue France, Beirut, Lebanon: plastics: raw materials: electric household appliances: radios: machinery for producing plastic products.

Laboratoires Gemska, 13 Rue de Roulers, Rumbeke, Belgium: rubber druggists' sundries.

A. 1 Retreading Co., 38-38a Argyle St., East London, South Africa: molds for the manufacture of rubber toys.

Ernest Brodure, 53 Rue des Anglais, Liege, Belgium: rubberized sheeting and cloth: rubber sponges.

Etablissements Henri Wouters S. A., 39-47 Rue Marche aux Herbes, Brussels, Belgium: floor coverings.

Hassan Hakimi, representing Machinkai San'ati Co., 322 Teharah Mokhber-el-Dowleh, Tehran, Iran: tires and tubes and machinery of all kinds.

Mrs. S. Nelson, representing H. B. Agencies, 12 Duke St., St. James's, London, S.W.1, England: electric wire and cables: suspenders and garters: foundation garments: radios: textiles.

Michel Mavropoulo, 29 Winston Churchill St., Athens, Greece: tires: textile machinery: cotton yarn and thread.

Grigori Mirzatuny, 302 Teharah Mokhber-el-Dowleh, Tehran, Iran: tires and tubes: machinery: electric appliances.

Jamshid Soheil, representing Jamshid Soheil Trading Co. and Aman Trading Co., Ltd., both at Kabiban Bargh, Tehran, Iran: automotive accessories: tires and tubes: all types of machinery: radios: electrical appliances.

Morad Bin Yousuf Behbehani, Kuwait, Sheikdom of Kuwait, Iraq: automobile accessories, tires.

Wilfred Thuren, 8 Vastmannagatan, Stockholm, Sweden: automobile and marine accessories.

Sarba Publishing Co., 60 Rue Ravenstein, Brussels, Belgium: erasers, pencils, fountain pens.

L. W. Zerner, 68 Sathorn Rd., Bangkok, Siam: acetic acid 99% strength for coagulating rubber.

Casa Arturo (Viuda de Arturo Fernandez Iglesias), Hortaleza 9, Madrid, Spain: sporting goods, novelties, fishing tackle, toys.

Sportapools, Ltd., 30 Floral St., London, W.C.2, England: polyvinyl chloride sheeting 0.007-8-inch thick.

Emsa Works and Herbert Foot Appliance, Ltd., Paterson St., Blackburn, Lancs., England: surgical foot arch supports, hose savers, heel grips, stocking protectors, insoles, heel pads, rubber brushes.

Sabean Utility Corp., Ltd., 14 Churchill Rd., Addis Ababa, Ethopia: rubber tires for automotive vehicles.

Vanacker & Cie., 86 Rue de Marquillies, Lille, (Nord), France: rubber for shoes.

E. W. Duder, 40 Rosedale Rd., Toronto 5, Ont., Canada: adhesives.

English Exporters (London), Ltd., 9-10 Marble Arch, London, W.1, England: rubber goods; chemicals: shoes.

Rims Approved and Branded by The Tire & Rim Association, Inc.

RIM SIZE	Feb., 1947
15" & 16" D. C. Passenger	
15x4.00E	16,441
16x4.00E	388,369
15x4.50E	9,214
16x4.50E	256,450
15x5.00E	149,673
16x5.00E	6,188
16x5.00F	2,088
15x5.50F	64,058
16x5.50F	37,027
16x4.00E—Hump	229,190
15x4.50E—Hump	28,313
16x4.50E—Hump	19,829
15x5.00F—Hump	11,146
15x5-K	33,225
16x5-K	128,010
16x5½-K	10,938
15x6-L	36,726
16x6-L	87,643
15x6½-L	31,678
17" & Over Passenger	
18x2.15B	1,223
Flat Base Truck	
20x3.75P	299
17x4.33R	23,213
20x4.33R	34,385
17x5.0	11,500
18x5.0	5,278
20x5.0	11,894
15x5.00S	5,029
18x5.00S	110
20x5.00S	280,902
24x5.00S	997
20x6.0	105,044
20x6.00S	27,358
20x6.00T	25,120
15x7.0	755
20x7.0	3,171
20x7.00T	9,377
20x7.33V	48,149
22x7.33V	13,426
24x7.33V	2,022
19x8.37V	1,224
20x8.37V	325
24x8.37V	533
20x10.0	232
24x10.0	102
24x10.00W	228
Semi D. C. Truck	
16x4.50E	48,994
15x5.50F	42,462
16x5.50F	8,841
15x6.00G	2,015
16x6.00G	1,788
16x6.50H	123
Tractor & Implement	
12x2.50C	4,025
12x3.00D	42,301
15x3.00D	31,452
18x3.00D	5,221
19x3.00D	25,717
21x3.00D	2,182
20x4.50E	1,065
18x5.50F	10,426
16x4.25K	5,990
36x6.00S	1,097
24x8.00T	16,148
28x8.00T	2,702
32x8.00T	710
36x8.00T	752
W6-24	2,288
W6-30	22
W8-24	3,455
W8-32	1,675
W8-36	1,851
W8-38	1,489
W9-28	3,803
W9-38	4,565
W10-28	3,232
W11-26	491
DW9-38	19,633
DW10-36	1,997
DW10-38	19,936
DW10-42	1,990
DW11-28	2,759
DW11-30	1,335
DW11-32	1,952
DW11-36	892
DW14-28	1,500
DW14-30	1,169
DW14-32	792
Earth Mover	
24x15.00	185
TOTAL	2,489,124

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)
Allow nine words for keyed address.		*Replies forwarded without charge*

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS WANTED

TECHNICAL EXECUTIVE WITH 20 YEARS' EXPERIENCE IN rubber and plastics desires executive position in management, sales, technical service, or laboratory. College trained. Capable, efficient, and able to produce results. Qualified in management, compounding, research, development, and testing. Age 37, family. Address Box No. 826, care of INDIA RUBBER WORLD.

FACTORY SUPT., SMALL MECHANICAL GOODS FACTORY DEsired. 18 years' experience. Expert calender operator. Mill and compound supervisor, thorough knowledge of mechanical products and general management. Available two weeks after interview. Salary $6,000. Address Box No. 827, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST, M.S., M. I. T. FORMER INSTRUCtor with two years of experience in chemical research and compounding with leading rubber manufacturer seeks research-development work. Prefer Midwest. Available immediately. Address Box No. 832, care of INDIA RUBBER WORLD.

RUBBER CHEMIST, MARRIED, 20 YEARS' EXPERIENCE IN proofing. Thoroughly experienced in formulation and production of calendered and s read goods from vinyl resins, rubber, and synthetic rubber. Also experienced in latex and synthetic resin adhesives. Address Box No. 833, care of INDIA RUBBER WORLD.

SALES MANAGER, 20 YEARS' SALES AND MANAGEMENT EXperience. Technical background, now in rubber and plastics. Has handled market surveys, advertising, and sales promotion for manufacturers and wholesalers. Address Box No. 837, care of INDIA RUBBER WORLD.

ASSISTANT TO TECHNICAL MANAGER OF MEDIUM-SIZED plant desires greater responsibility and opportunity with progressive small- or medium-sized concern. Development compounder with three years' wide experience in factory processing of crude and synthetic rubbers, sponge rubber production, and compounding of molded goods. B.S., Ch. E., M.I.T., 1941. Single, 27. Address Box No. 838, care of INDIA RUBBER WORLD

MILL ROOM SUPERINTENDENT WITH PRACTICAL EXPERIence in compounding, mixing, calendering, tires, sundries, footwear, and vinyl film seeks position with responsible concern. Address Box No. 839, care of INDIA RUBBER WORLD.

CHEMIST, RESEARCH AND DEVELOPMENT, EXTENSIVE EXperience resins, rubbers, thermoplastics, cements, and pressure-sensitive adhesives, desires responsible position progressive growing company; West Coast considered. Address Box No. 842, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

CRUDE RUBBER: YOUNG MAN, EXPERIENCED, KNOWLEDGE trade conditions also consumers. Details treated confidentially. Address Box No. 823, care of INDIA RUBBER WORLD.

TECHNICAL MAN WITH SOME COMPOUNDING AND FACTORY experience for midwest company processing mechanical goods. Please write fully, giving experience and salary expected. Address Box No. 824, care of INDIA RUBBER WORLD.

CHEMIST: YOUNG MAN WITH PRACTICAL EXPERIENCE FOR small molding and extruding plant. Give full details. Apply MARTIN RUBBER COMPANY, INC., Long Branch, New Jersey.

TIME-STUDY MAN: WITH ALL-AROUND RUBBER FACTORY experience. Give full details. Apply MARTIN RUBBER COMPANY, INC., Long Branch, New Jersey.

WANTED: GRADUATE CHEMIST OR CHEMICAL ENGINEER for work as assistant chemist in rubber plant located in Connecticut. State in detail in first handwritten letter: age, education, experience, if any, and remuneration expected. Address Box No. 825, care of INDIA RUBBER WORLD.

DEVELOPMENT CHEMIST FOR RESEARCH AND CONTROL of synthetic and natural rubber adhesives. Metropolitan area. State experience and salary expected. Enclose small photo. Address Box No. 829, care of INDIA RUBBER WORLD.

IN NEW ENGLAND WELL-ESTABLISHED PLANT HAS AN opening for a thoroughly experienced man to supervise production. Must have thorough knowledge of modern production methods. State particulars regarding experience, availability, and salary required in first letter. Address Box No. 830, care of INDIA RUBBER WORLD.

DEVELOPMENT CHEMIST, YOUNG, WITH SEVERAL YEARS' experience in rubber industry for development work on synthetic rubbers, adhesives, plastics used in fabric coatings. Excellent opportunity. Metropolitan New York Area. In reply give complete résumé and minimum salary requirements. Enclose small photo. Address Box No. 831, care of INDIA RUBBER WORLD.

RUBBER CHEMIST: GOOD OPPORTUNITY FOR EXPERIENCED man with new company in northern Alabama. Complete plant — reclaiming and finished products flooring, sponge, shoe soling, etc. Excellent housing in city of 50,000. Good salary and profit-sharing deal can be arranged for man who knows his business. Address Box No. 836, care of INDIA RUBBER WORLD.

Classified Advertisements Continued on Page 145

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	January, 1947 Quantity	January, 1947 Value	January, 1946 Quantity	January, 1946 Value
UNMANUFACTURED				
Balata .... *lbs.*	688	$ 2,396	3,129	$ 4,132
Crude rubber .... *lbs.*	5,208	1.520	501,821	72,054
Latex .... *lbs.*	25,124	7.674	......	......
Rubber, powdered and waste .... *lbs.*	898,300	25,122	509,100	14,804
Recovered .... *lbs.*	1,832,100	147,034	2,790,700	197,068
Synthetic and substitubes .... *lbs.*	436,600	103,790	326,200	95,524
TOTALS.	3,198,020	$ 287,536	4,130,950	$ 383,582
PARTLY MANUFACTURED				
Comb blanks of hard rubber	......	$ 712	......	$ ......
Hard rubber in rods or tubes .... *lbs*	923	877	594	623
Rubber thread, not covered .... *lbs.*	3,013	3.174	8.460	8,534
TOTALS.	3,936	$ 4,763	9,054	$ 9,157
MANUFACTURED				
Belting	......	$ 75,216	......	$ 44,624
Boots and shoes of rubber, n.o.p. .... *prs.*	10,367	13,566	2,411	1,479
Canvas shoes with rubber soles .... *prs.*	414	1,156	24	86
Cement	......	30,722	......	13,477
Clothing of waterproofed cotton or rubber........	......	3,016	......	222
Druggists' sundries	......	39,237	......	36,062
Gaskets and washers	......	25,372	......	14,172
Gloves .... *doz. prs.*	1,375	4,733	418	2,091
Golf balls .... *doz.*	410	1,869	2	21
Heels .... *prs.*	5,064	495	3,986	578
Hose	......	42,528	......	25,439
Hot water bottles	......	11.735	......	1,560
Inner tubes, n.o.p. .... *no.*	829	5.310	285	488
Bicycle .... *no.*	1,054	588	152	128
Liquid sealing compound..	......	20,593	......	711
Mats and Matting	......	45,525	......	13,279
Nursing nipples .... *gross.*	181	895	579	1.873
Packing	......	9,309	......	8,046
Raincoats	1,460	4,573	......	......
Tires, pneumatic, n.o.p. *no.*	7.240	139,450	253	5,057
Bicycle .... *no.*	504	759	714	917
Solid, for automobiles and motor trucks *no.*	......	......	4	201
Other	......	4,691	......	770
Tire repair material	......	12,760	......	4,796
Other rubber manufactures	......	247,377	......	196,669
TOTALS.	......	$ 741.475	......	$ 372,746
TOTAL RUBBER IMPORTS.	......	$1,033,774	......	$ 765,485

Exports of Crude and Manufactured Rubber

	January, 1947 Quantity	January, 1947 Value	January, 1946 Quantity	January, 1946 Value
UNMANUFACTURED				
Crude rubber, including synthetic rubber .... *lbs.*	7,406,119	$1,371,004	392,117	$ 90,876
Waste rubber .... *lbs.*	1,634,300	29,993	2.228,400	32,437
TOTALS.	9,040,419	$1,400,997	2,620.517	$ 123,313
PARTLY MANUFACTURED				
Soling slabs of rubber.. *lbs.*	11,319	$ 3,249	1,748	$ 338
MANUFACTURED				
Bathing caps	......	$ 440	......	$ ......
Belting, n.o.p. .... *lbs.*	369,992	229,009	362,570	205,536
Belts, fan	......	9,540	......	6,008
Boots and shoes of rubber, n.o.p. .... *prs.*	191,532	289,551	229,259	412,013
Canvas shoes with rubber soles .... *prs.*	178,335	202,787	188,991	170,022
Clothing of rubber and waterproofed clothing....	......	44.559	......	20,537
Heels .... *prs.*	97,263	11,509	97,951	8,149
Hose	......	75,328	......	56,380
Inner tubes for motor vehicles .... *no.*	62,422	139.671	19.142	50,282
Soles .... *prs.*	49,487	7,613	13,562	3,544
Tires, pneumatic, for motor vehicles........ *no.*	47,814	747.616	20.960	418,125
Other .... *no.*	1,647	1,275	7,851	8,970
Wire and cable, copper, insulated	......	78,684	......	108,090
Other rubber manufartures..	......	55,066	......	78,936
TOTALS.	......	$1.892.648	......	$1,546,608
TOTAL RUBBER EXPORTS.	......	$3,296,894	......	$1,670,243

Miyasaki & Co., Inc., firm of importers and exporters, wrote us recently to say that it is still carrying on a business in all kinds of rubber and general merchandise as before the war, at 26 Nichome, Kaigan-dori, Kobe, Japan. Managing Director T. Miyasaki expects that trade will soon return to a normal state.

BUSINESS OPPORTUNITIES

WANTED: BY OLD-ESTABLISHED RUBBER MANUFACTURER sales representative with technical knowledge of Hose, Belting, Packing, Molded and Extruded Specialties. Area: Metropolitan New York. Address Box No. 820, care of INDIA RUBBER WORLD.

INVENTOR REQUIRES FINANCIAL ASSISTANCE TO MANUfacture patented rubber product with a tremendous potential. One hundred to two hundred thousand dollars estimated required. Write A. ROBERT D'AMICO, Cove Rd., Stonington, Conn.

COMPLETE PLANT FOR SALE: LONG ESTABLISHED, PROducing tank and pipe linings, rubber-covered rolls, plastic films. New equipment. Banbury, mill, calender, etc. Address Box No. 841, care of INDIA RUBBER WORLD.

MISCELLANEOUS

MANUFACTURERS solid rubber molded parts made to your specifications from your molds (molds supplied), also extruded strip, lathe cut washers, die cut parts. THE STALWART RUBBER COMPANY, 507 Fifth Ave., New York. (MU 7-7335.)

HYCAR OR-25 SOLUTION (22% SOLIDS) IN MEK-XYLOL FOR sale—4,000 to 5,000 lbs. Address Box No. 840, care of INDIA RUBBER WORLD.

Classified Advertisements Continued on Page 146

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY AND SUPPLIES FOR SALE

LIQUIDATING SURPLUS EQUIPMENT (BOSTON AREA): 4—36 x 40" Hydraulic Presses, 22" rams, 4 opening and 6 opening. 1—48 x 48" 4-10" rams, 4 opening, 2000 # pressure. Line of 2—18 x 50" Mills with enclosed reduction drive and 150 h.p. motor. 2—18 x 50" Mills with drives. Hydraulic Rubber Cutter. 6—2¾ x 8" Aldrich Triplex Hydraulic Pumps with 74 h.p. motors. Many Other Items. Send for Detailed List. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York 7, N. Y.

FOR SALE: 1—8 x 16 EXPERIMENTAL MILL, 4—12 x 12 Hydraulic presses, 1—8 x 18 four-roll Shoe Calender, 1—50" three-roll Calender, 1—60" Doubling Calender, 1—Hot Facing Calender, 1—60" Saturator, 6—Rubber Spreaders, 1—Pyroxylin Spreader, 10—200-gallon Churns, 2—40-gallon Pony Mixers, 1—Embossing Calender, 12—Heel Trimming Machines, 2—40" Mills, 2—60" Mills, 1—36" Cracker, 1—#2 Royle Tubing Machine, 3—30 x 30" Hydraulic Presses, 3—24 x 24 Hydraulic Presses, 1—Gooseneck Press 20" x 10'. Address Box No. 821, care of INDIA RUBBER WORLD.

FOR SALE: 2—BAKER PERKINS SIZE 15, 100-GAL. JACK. MIXers. W.&P. 9-Gal. Double Arm Mixer Stokes RD4 Rotary Preform Tablet Machines, 1—3/16" dia., also 5/16" & 7/16": New 40-gal. Pony Mixers: Farrel 16" x 48" 2-Roll Rubber Mill: 400-ton Hydraulic Extrusion Press: Large Stock Hydraulic Presses from 12" x 12" to 42" x 48" platens, from 50 to 500 tons: Hydraulic Pumps & Accumulators: Injection Molding Machines: Mixers: Grinders: Kettles: Etc.

WE BUY YOUR SURPLUS MACHINERY
STEIN EQUIPMENT CO.
426 BROOME STREET, NEW YORK 13, N. Y.

FOR SALE: ONE 220-V. 2,400-WATT LABORATORY DRYING oven range to 550° F., in low, medium, and high heat. 18" by 20" by 24". One Knowlton laboratory spreader, coating area 12" by 36". Used very little. Address Box No. 834, care of INDIA RUBBER WORLD.

FOR SALE: 2 W. & P. 100-GAL. DOUBLE ARM MIXERS—SIGMA Blades, Jacketed, Hydraulic Tilt, #15 JMN; 1—W. & P. ½-Gal. Laboratory Mixer—Double Arm Jacketed: 1—Ball & Jewel "Imperial" Rotary Cutter: 1—Watson-Stillman 12" Hydraulic Press, 100-Ton: 2—Stokes Rotary DD 2 Tablet Machines 5 h.p. Motors. What Have You For Sale? THE MACHINERY & EQUIPMENT CORP., 533 West Broadway, New York 12, N. Y.

BERLOW AND SCHLOSSER CO.

Consultation and Technical Service
Paper, Textile and Wringer Rolls—Mechanicals
Molded Specialties—Cut Rubber Thread
537 INDUSTRIAL TRUST BUILDING, PROVIDENCE 3, R. I.

MACHINERY & SUPPLIES WANTED

WANTED: 1 Cameron cutting machine, Model 4-D Camachine #26, 50" preferred. Address Box No. 818, care of INDIA RUBBER WORLD.

ONE NO. 9 BANBURY MIXER IN GOOD CONDITION. ADDRESS Box No. 819, care of INDIA RUBBER WORLD.

WANTED: ONE #3 BANBURY MIXER. ADDRESS BOX NO. 822, care of INDIA RUBBER WORLD.

WANTED: 6 x 12 LABORATORY PLASTIC MILL, NEW OR used. Address HOOVER COLOR CORPORATION, 1250 Sixth Ave., New York, N. Y.

WANTED TO BUY ONE USED LABORATORY BANBURY AND one used laboratory extruder for insulated wire. Both should be in good condition. Write giving complete description of units and motor and price. Address Box No. 828, care of INDIA RUBBER WORLD.

WANTED: ONE VULCANIZER APPROXIMATELY 8' x 20'. Address Box No. 835, care of INDIA RUBBER WORLD.

WANTED TO BUY

One rubber strainer. Minimum capacity, 1000 pounds per hour.

THE CRESCENT COMPANY, INC.
Pawtucket, R. I.

WANTED

6 Braiders in good condition to braid hose 2⅛" O.D. Give complete details in first letter, when and where inspection can be made, and best price.
Address:
Box No. 817, Care of INDIA RUBBER WORLD

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS

NATIONAL SHERARDIZING & MACHINE CO.
868 WINDSOR ST. HARTFORD, CONN.
Representatives
Akron San Francisco New York

GRANULATED CORK

FOR EXTENDING RUBBER

SOUTHLAND CORK COMPANY
P. O. BOX 868 NORFOLK, VA.

HOWE MACHINERY CO., INC.
30 GREGORY AVENUE PASSAIC, N. J.
Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT
Call or write.

Old established British Manufacturers of

Plastic and Rubber merchandise are interested in manufacturing under licence or outright purchase in (a) British Isles and (b) British Empire and Continental Europe a range of specialised rubber and plastic productions. Primarily interested in toys and games, sports, surgical and domestic productions.

Write with full details to Box No. 1250, c/o 10, Hertford Street, Mayfair, London. ENGLAND

Wanted INDUSTRIAL ENTERPRISE

CASH PAID

BY FOR CAPITAL STOCK or ASSETS
large financially powerful diversified organization wishing to add another enterprise to present holdings.
Existing Personnel Normally Retained
Box 1220, 1474 B'way, New York 18, N. Y.

HYDRAULIC PUMPS

Aldrich Pump Co. Vertical Triplex HYDRAULIC PUMPS, 2¾" x 8", equipped with Herringbone Gears, 67.5 GPM. Maximum pressure for intermittent duty 2,200 lbs., for continuous duty 1,800 lbs. Pump and motor mounted on common bed plate.

Motors are 75 HP, 3/60/220-440 volts, 1740 RPM. Complete with starting panel, consisting of G. E. motor-starter switch, push button control, square "D" Switch, and capacitator.

Purchased new 3½ years ago. Excellent condition. Available for immediate delivery.

CONSOLIDATED PRODUCTS CO., INC.
13-16 PARK ROW NEW YORK 7, N. Y.

GET MORE FOR YOUR SURPLUS EQUIPMENT

List it with our bureau
And Sell Directly to the next user.

All Rubber Manufacturers Get Our Offerings Regularly. They need such units as

RUBBER MILLS CALENDERS
BANBURY and W & P MIXERS
EXTRUDERS VULCANIZERS
HYDRAULIC PRESSES

For Quicker Action and Better Price
Send Full Details and YOUR Price to

EQUIPMENT FINDERS BUREAU
6 Hubert Street New York 13, N. Y.

INDEX TO ADVERTISERS

This index is maintained for the convenience of our readers. It is not a part of the advertisers' contract, and INDIA RUBBER WORLD *assumes no responsibility to advertisers for its correctness.*